2025 Workshop

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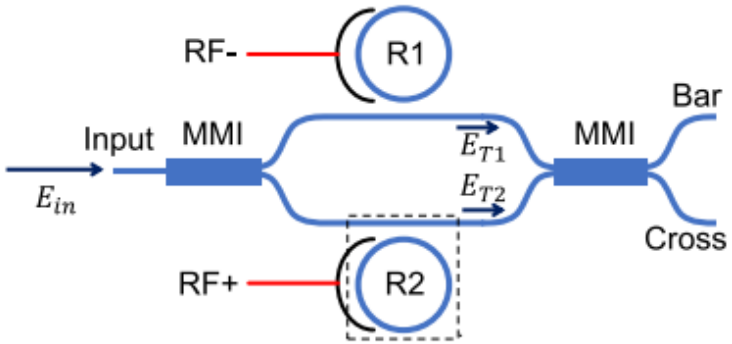
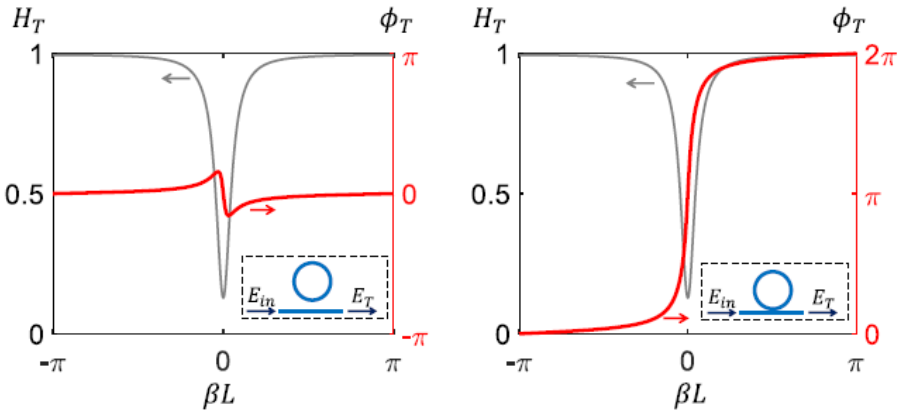
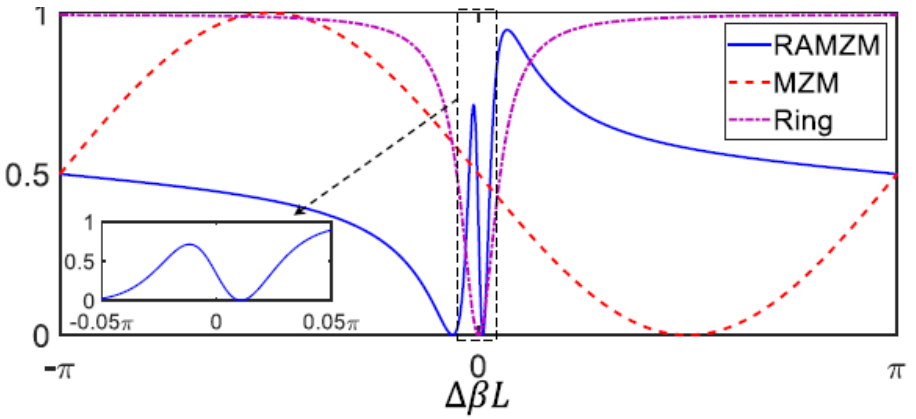
Ring Assisted MZM

- **RAMZM**





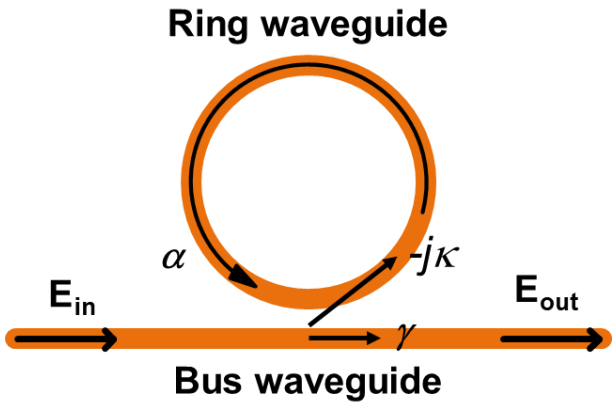
<Under & over coupled ring's phase>



<Transfer function of RAMZM>

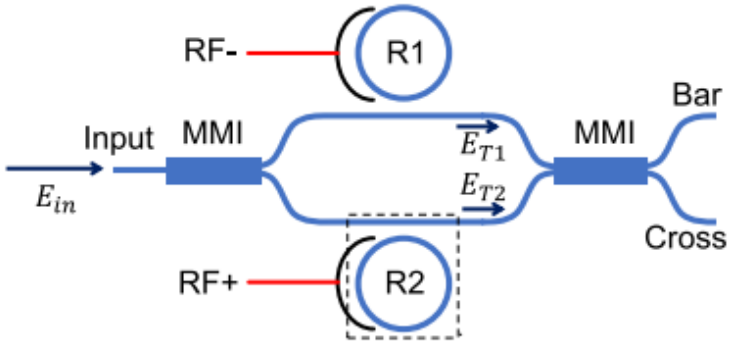
- ✓ High ER
- ✓ Good linearity
- ✓ Small size

Difference between MRM and RAMZM



Micro Ring Modulator (MRM)

- **Doping ↓ → Modulation efficiency ↓ → BW ↓**
- **Doping ↑ → Low Q → Bad IL**



Ring Assisted Mach-Zhender Modulator (RAMZM)

- **Low doping → Modulation efficiency ↓ → BW ↓**

⇒ **over-coupled ring (low Q)**

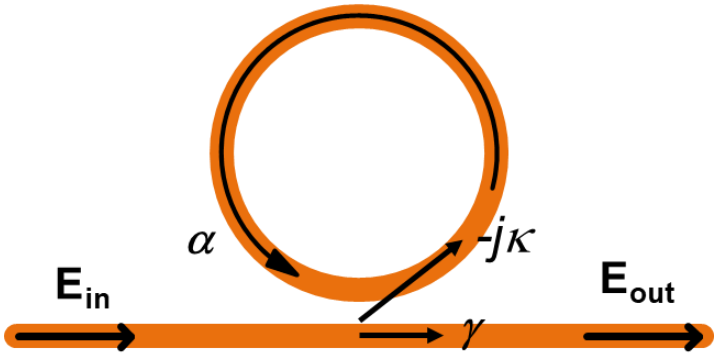
- **low Q → low ER**

⇒ **Multiple ring (as phase shifter)**

In low Q condition CMT doesn't match!

RTT & CMT Comparison

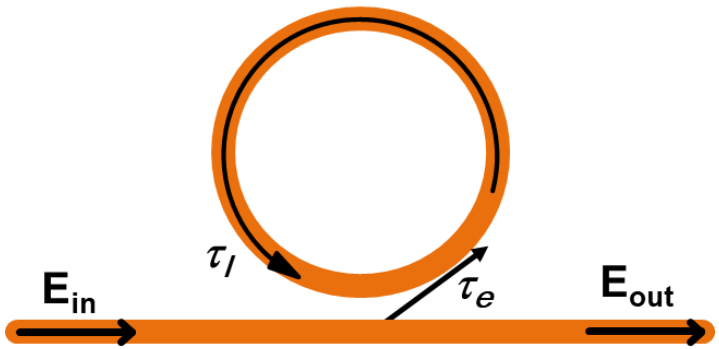
Round-Trip Theory (RTT)



$$T = \left|\frac{E_{out}}{E_{in}}\right|^2 = \frac{\alpha^2 + \gamma^2 - 2\alpha\gamma\cos(\phi)}{1 + (\alpha\gamma)^2 - 2\alpha\gamma\cos(\phi)}$$

- ✓ **Pros** : Accurate numerical analysis
- ✓ **Cons** : Slow dynamic simulation time

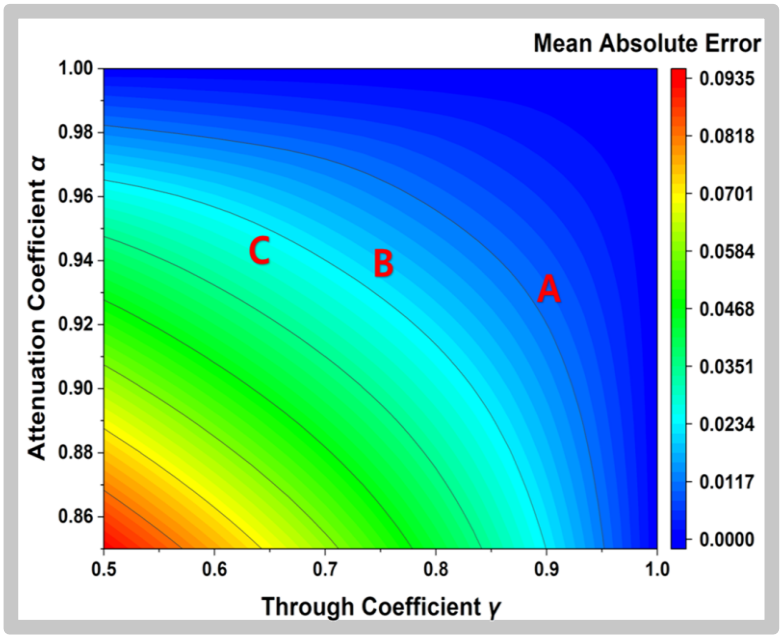
Coupled-Mode Theory (CMT)



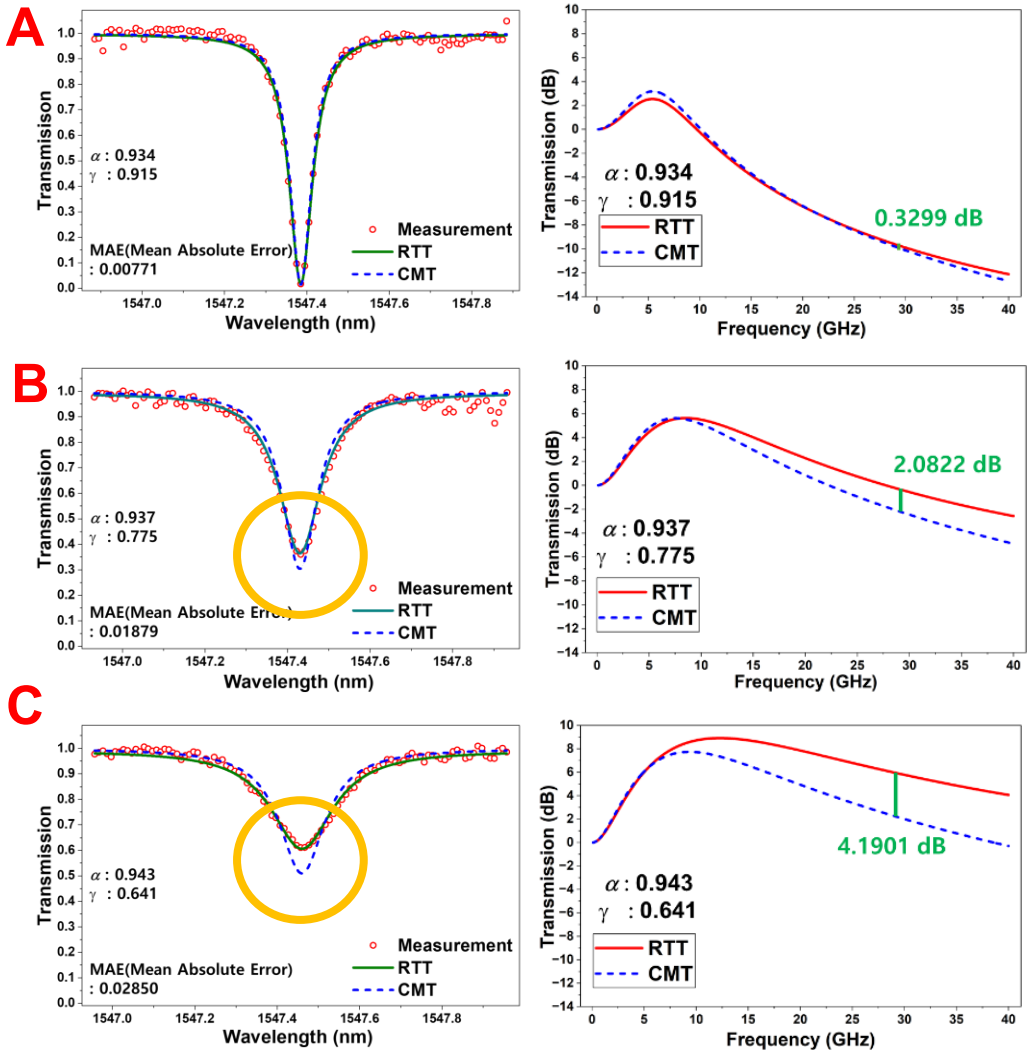
$$T = \left|\frac{E_{out}}{E_{in}}\right|^2 = \left|\frac{j(\omega-\omega_0) + \frac{1}{\tau_l} - \frac{1}{\tau_e}}{j(\omega-\omega_0) + \frac{1}{\tau_l} + \frac{1}{\tau_e}}\right|^2$$

- ✓ **Pros** : Fast dynamic simulation time, Co-simulation with the EIC
- ✓ **Cons** : Approximate model

RTT & CMT Comparison



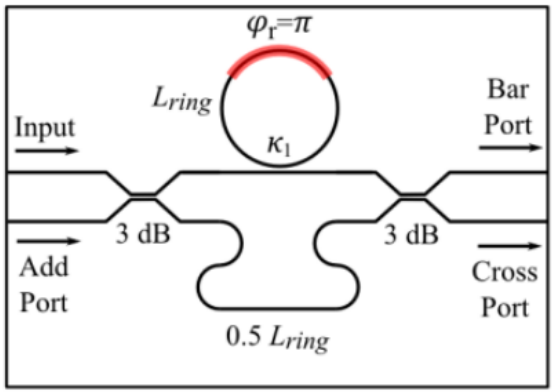
Mean absolute error between RTT and CMT



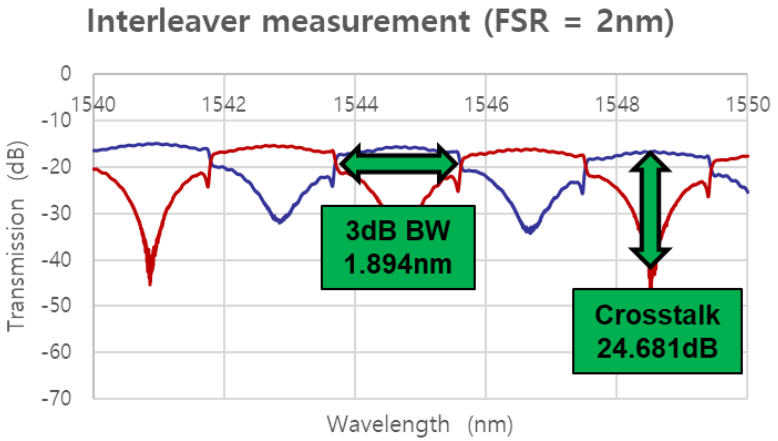
DC transmission **EO S21**

NanoSOI Chip fabrication

- **Interleaver**



<2010 Optics Express, L. Luo *et al.*>



1st **2nd**