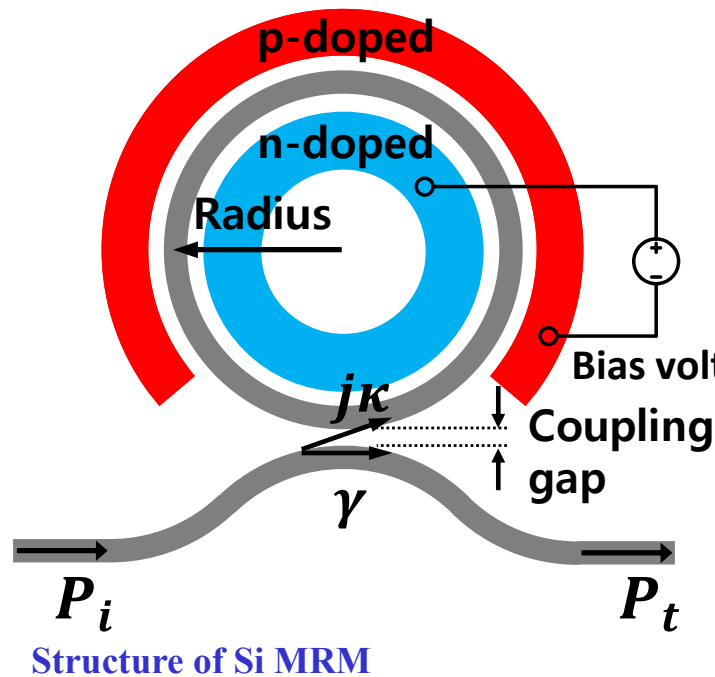


# Silicon Micro Ring Modulator (Si MRM)



## ✓ Key parameter of modulator

- $\alpha$ : loss coefficient ( $L$ )
- $\kappa$ : coupling coefficient ( $g, l_c$ )
- $\tau$ : through coefficient ( $g, l_c$ )

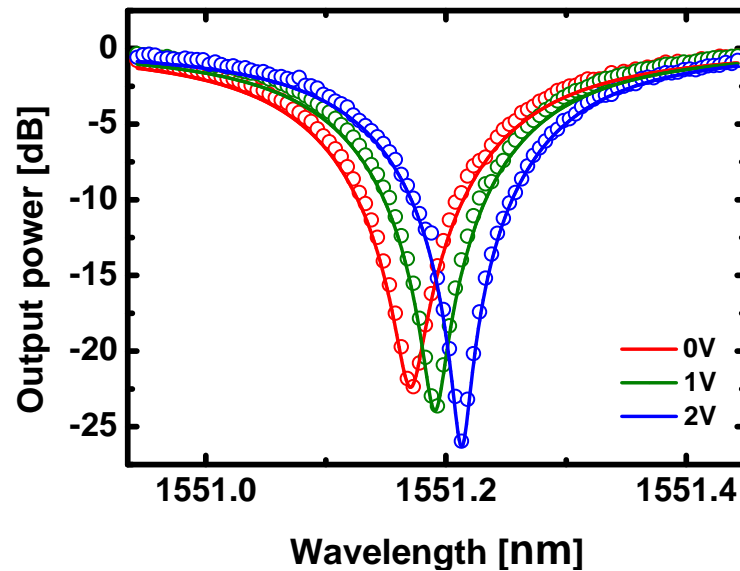
## ✓ Transfer function

$$T = \frac{P_t}{P_i} = \frac{|E_t|^2}{|E_i|^2} = \frac{\alpha^2 + |\tau|^2 - 2\alpha|\tau|\cos\theta}{1 + \alpha^2|\tau|^2 - 2\alpha|\tau|\cos\theta}$$

$$\theta = \frac{2\pi n_{eff} L}{\lambda}$$

$$\text{- At resonance, } T_{min} = \frac{(\alpha - \tau)^2}{(1 - \alpha\tau)^2}$$

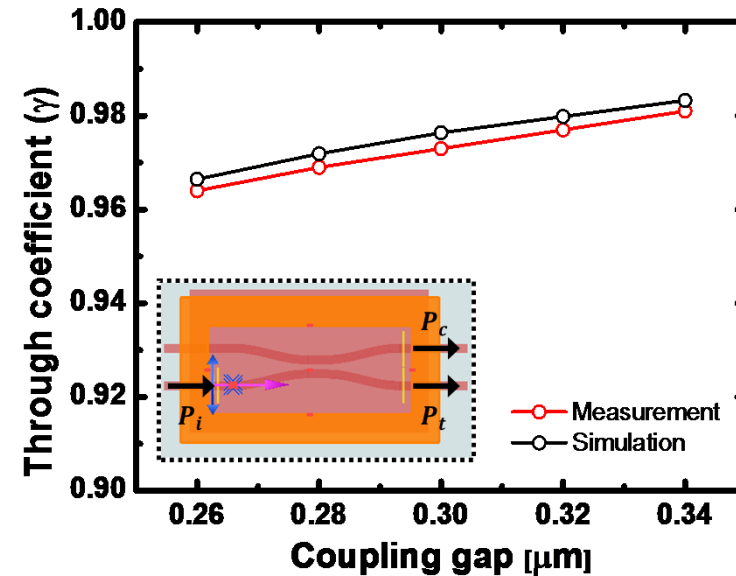
# Silicon Micro Ring Modulator (Si MRM)



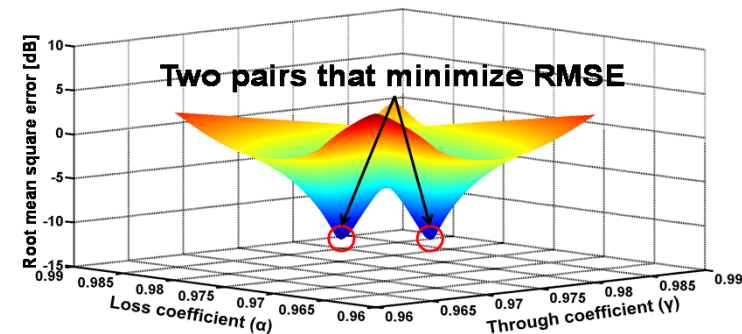
Measurement and fitted transmission curve as various  $V$  ( $r = 8 \mu\text{m}$ ,  $g = 0.3 \mu\text{m}$ , and  $l_c = 0 \mu\text{m}$ )

Bias voltage	$\alpha$	$\gamma$	$n_{\text{eff}}$
0 V	0.9688	0.973	3.82659
-1 V	0.9692	0.973	3.82664
-2 V	0.9695	0.973	3.82669

Extracted key parameters ( $\alpha$ ,  $\gamma$ ,  $n_{\text{eff}}$ )



Extracted  $\gamma$  from measurement and simulation



Root mean square error (RMSE) on  $\alpha$  and  $\gamma$