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***Abstract*—Blah, Blah.**

***Index Terms*—Ryan Chung.**

I. Introduction

To meet the demand for higher processing speed and data capacity Blah,

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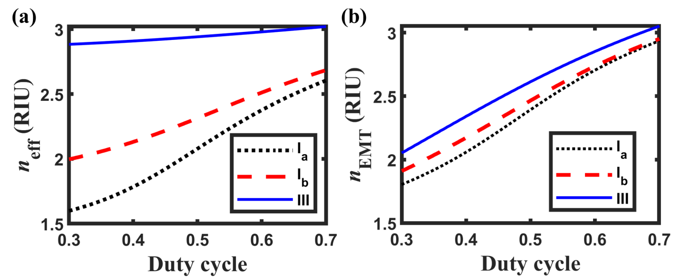

Fig. 1. Schematic **(a)** 3-D and **(b)** top views of the proposed MMWBG.

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In this study, Blah,

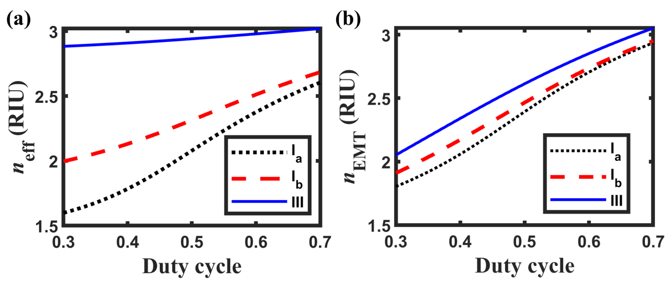

Fig. 2. Effective refractive indices of the first three TE modes versus core widths for four channel wavelengths.

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II. Device principle and optimization

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$$\frac{\partial B_\mu}{\partial z} = j\kappa_{\mathrm{dc},\mu\mu} B_\mu + j\kappa_{\mathrm{ac},\nu\mu} A_\nu \cdot e^{-j(\Delta\beta z - \phi(z))}, \tag{1}$$

$$\frac{\partial A_\nu}{\partial z} = -j\kappa_{\mathrm{dc},\nu\nu} A_\nu - j\kappa_{\mathrm{ac},\mu\nu} B_\mu \cdot e^{j(\Delta\beta z - \phi(z))}, \tag{2}$$

$$\kappa_{\mathrm{dc},(\nu\nu,\mu\mu)} = \frac{\omega\varepsilon_0}{4} \iint \Delta\varepsilon_{\mathrm{r,dc}}(x,y)\mathbf{E}_{\nu,\mu}(x,y) \cdot \mathbf{E}^*_{\nu,\mu}(x,y)\mathrm{d}x\mathrm{d}y, \tag{3}$$

$$\kappa_{\mathrm{ac},(\nu\mu,\mu\nu)} = \frac{\omega\varepsilon_0}{4} \iint \Delta\varepsilon_{\mathrm{r,ac}}(x,y)\mathbf{E}_{\nu,\mu}(x,y) \cdot \mathbf{E}^*_{\mu,\nu}(x,y)\mathrm{d}x\mathrm{d}y, \tag{4}$$

$$\begin{bmatrix} R(z) \\ S(z) \end{bmatrix} = \begin{bmatrix} T_{11}(z) & T_{12}(z) \\ T_{21}(z) & T_{22}(z) \end{bmatrix} \begin{bmatrix} R(0) \\ S(0) \end{bmatrix}, \tag{5}$$

$$T_{11(22)}(z) = \cosh(\alpha z) \underset{(+)}{-} j\frac{\delta}{\alpha}\sinh(\alpha z), \tag{6}$$

$$T_{12(21)}(z) = \underset{(+)}{-} j\frac{\kappa_{\mathrm{ac},\{\mu\nu(\nu\mu)\}}}{\alpha}\sinh(\alpha z), \tag{7}$$

$$\delta = \frac{1}{2}(\kappa_{\mathrm{dc},\nu\nu} + \kappa_{\mathrm{dc},\mu\mu} + \Delta\beta), \tag{8}$$

$$\Delta\beta = \beta_\nu + \beta_\mu - \frac{2\pi N}{\Lambda}, \tag{9}$$

$$\left|\frac{S(0)}{R(0)}\right|^2_{S(L)=0} = \left|\frac{-j\frac{\kappa_{\mathrm{ac},\nu\mu}}{\alpha}\sinh(\alpha L)}{\cosh(\alpha L) + j\frac{\delta}{\alpha}\sinh(\alpha L)}\right|^2. \tag{10}$$

TABLE I
REQUIRED BRAGG PERIODS FOR THE FOUR-CHANNEL CWDM SYSTEM.

λ_{ch} (μm)	1.27	1.29	1.31	1.33
Λ_{ch} (nm)	392	400	408	416

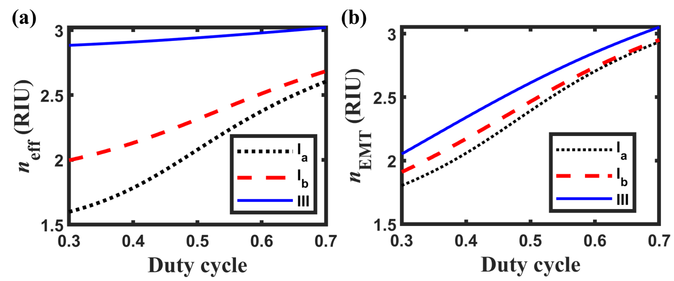

Fig. 3. Simulated filtering responses using 3-D FDTD method for $\lambda_{\mathrm{ch}} = 1.27$ μm in terms of $\Lambda_{\mathrm{ch}} = 392$ nm and different maximum width corrugations Δw.

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Blah, amplitude apodization shown in Fig. 1(b) are

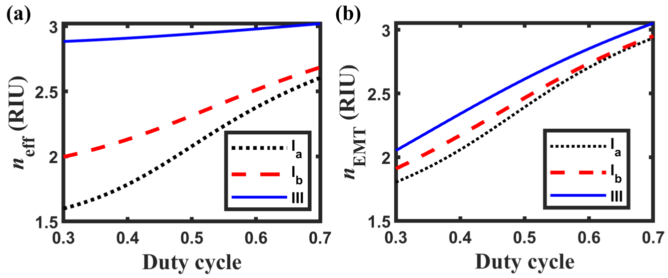

Fig. 4. Simulated filtering responses of **(a)** the contra-directional coupled TE_1 mode, **(b)** the remaining forward TE_0 mode, and **(c)–(f)** the electric-field top-view profiles at the given four channel wavelengths, respectively, for the corresponding individual MMWBGs using the 3-D FDTD solutions in terms of the parameter set (W, Δw, s) = (950 nm, 65 nm, 5).

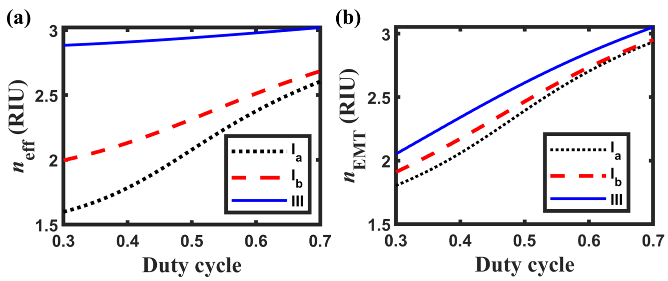

Fig. 5. Schematic top view of the SiN_x-based BADC for broadband coupling from the TE_1 mode at through port to the TE_0 mode at cross port.

determined to satisfy $\lambda_r = \lambda_{ch}$, Blah[1], Blah,

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TABLE II
PERFORMANCE COMPARISON OF CWDM FILTERS IN THE LITERATURE.

Structure	Blah[a]	Blah	Blah	Blah	Blah	Blah
Blah, Blah, Blah, Blah	5–6	−27	InP/O	3	< 3	–
Blah, Blah, Blah, Blah	∼3	−25	Si/O	∼11	∼12.8	–
Blah, Blah, Blah, Blah	∼3	−22	Si/C	∼5.7	∼7.5	–
Blah, Blah, Blah, Blah	2–3	−30	SiN/O	∼6.7	5.7	< 3
Proposed Structure	< 1	**−28**	SiN/O	**13.45**	**∼15.7**	**14.35**

[a] 1-dB bandwidth measured from the transmission peak.

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III. ANALYSIS OF FABRICATION TOLERANCE

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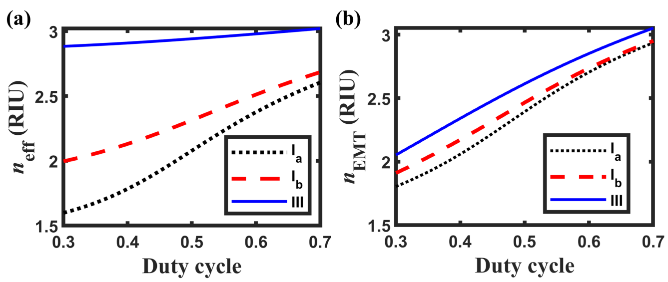

Fig. 6. Simulated filtering responses of the individual MMWBGs using 3-D FDTD method at the four channels in terms of the configuration in Fig. 1 and the given over-etching errors W_{e} within ($\pm$18 nm) with a step of 6 nm.

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IV. Conclusions

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Acknowledgments

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References

[1] T. Baehr-Jones *et al.*, “Myths and rumours of silicon photonics,” *Nature Photon.*, vol. 6, no. 4, pp. 206–208, Mar. 2012, doi: 10.1038/nphoton.2012.66.