2D-BPM Sパラメータ

実習7.MMIの設計 指定帯域でのパワー分岐





Noah Consulting Limited



図1.導波路プロジェクトの作成





図3. 導波路構造選択

🦽 Waveguide –	Waveguide Editor
	Waveguide Editor
	P Q Q N II
	20.00 9.00 -2.00 -2.00 -2.00 -3.00 -5.00 -2.00 -5
	Name Variable Expression Comment Width W 5.0000 ✓ 0K Waveguide Width WGW 12.0000 ✓ 0K Thickness D 5.0000 ✓ 0K Channel Bottom CB 5.0000 ✓ OK Cover DC 1.0000 ✓ OK Layer1 D1 19.0000 ✓ OK Substrate DS 2.0000 ✓ OK
	🖣 Back Next 🕨 🧹 Finish 🧼 Help 🗡 Cancel

図4. 導波路構造定義(寸法)

🦽 Waveguide -	- Waveguide Editor
	Waveguide Editor
	2000 9.00 -2.00 -2.00 -6.00 -6.00 -6.00 -6.00 -6.00 -6.00 -6.00 -6.00 -6.00 -6.00 -7 -2.00 -7 -2.00 -6.00 -7 -2.00 -7 -2.00 -7 -2.00 -7 -2.00 -7 -2.00 -7 -2.00 -7 -2.00 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7
A	Geometry Materials J Auto Refresh
Comments of the second	Domain Material / Index Index Index (R) Index (I) Background Befractive Index Background Befractive Index • 1.0.00
3.	Cover Material
	Layer1 Copy of Pure Silica
	▶ Channel Copy of 6.3% GeO2 ■ Three-term S Three-term S
	▲ Back Next ► ✓ Finish Help Cancel
	凶5. 導波路屈折率設定

/ 1.4µmから1.6µmの範囲



図6.波長範囲の設定



図7.Y(横)方向メッシュ



図8.X(縦)方向メッシュ

堡 Waveguide So	lver Setting				
General Information	FD Mode Solver Setti	ing			
General Setting A	dvanced Setting				
Polarization					
с×	CY @		Polarization Coupling		
Mode		Solver Type			
Real	C Complex	 Direct 	C Iterative		
Number of Mode:	1	Mode Symmetry Symmetric	c C Anti-Symmetric		
🔽 Perfectly Mate	ched Layer Boundary (Condition (PML)	Setting	1	
		\frown			
		<u>R</u> un	<u>C</u> lose 🤌 <u>H</u> e	elp	
	図9.仮	扁波選択		設定が終われ	っば

構造的には偏波依存が無い導波路構造としているが、ここでは練習のために両偏波での計算を選択した。

/正常終了では、これらのボタンが有効となる



図10.実行後の画面



図11.波長と等価屈折率



図12.フィールド分布(@1.5µm)

ここからデバイス設計

== Device - Cr	eate Device Project
	Create Device Project
	Project
	D_MMI-3dB
	Description
	新規にプロジェクト作成
	How to create ・ Pre-defined 予め用意されているMMIテンプレートの使用
	🖣 Back Next 🕨 Finish 🤣 Help 🗡 Cancel

図13.D_MMI-3dBのデバイスプロジェクト作成

== Device - Se	lect Waveguide Information				
	Select Waveguide Information				
	Waveguide Selection				
	Load waveguide information	User Input		Import کے	
	Waveguide Projects				
	Project Name	Created By	Waveguide N	lame 🔼	
	W test	Administrator	W test-Channel		
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	W_3layer	Administrator	W_3layer-User Defined Waveguide		
	W_A Deep-Etched Ridge Waveguide	APSS	W_A Deep-Etched Ridge Waveguide		
	W_ARROW Waveguide	APSS	Waveguide Ridge		
	W_Channel_MMI	Administrator	W_Channel_MMI-Channel		
	W_ChannelN6	Administrator	W ChannelN6		
	W_CrossLower	Administrator	W_CrossLower		
	W_CrossUpper	Administrator	W_CrossUpper-		
A	W_DFB1	Administrator	W_DFB1-Ridge		
Lanner,				✓	
				2	
	Variable Default Minimum Maximum	n Point Count	Units	Core	
	Wavelength 1.500000 1.400000 1.600000	21	um		
				Cladding	
	Back Next Finish	🛷 Help 🛛 🗙	Cancel		

図14.作成済みの導波路プロジェクトの選択



図15.作成済みの導波路プロジェクトの選択

🔫 Device - Se	lect Device Type		
	Select Device Type		
	Port       Number of ports         Left       Right         1       2         Ports Default Width       9         5       Image: Central Shape         Image: Central Shape       Function         Image: Central Shape       Image: Central Shape         Image: Central Shape       Function         Image: Central Shape       Image: Central Shape         Image: Central Shape	MMI Selection Position Symmetrical Arbitrary Pitch Equal Unequal Une	

図16.対称型MMIの選択

== Device -	Device Editor			
	Device Editor			
٢		737.50		
	Geometry Materials	Auto Refresh	fresh	
	Name	Variable	Expression	Comment
		L1	50.0000	🖌 ОК
	Length of right ports	L2	50.0000	🖌 ОК
E The	Length of coupler	L	1375.0000 🛛 🔤	🖌 OK
des .	Width of coupler	W	50.0000	🖌 OK
	Port width	WPort	5.0000	🖌 ОК
	Port pitch	D	25.0000 😐	🖌 ОК
	Reflection region1	F1	Min(0.5, L1/2) 🛛 🔤	🗸 ОК
	Reflection region2	F2	Min(0.5, L/4) 🛛 🔤	🖌 ОК
	<ul> <li>Reflection region3</li> </ul>	F3	Min(0.5, L/4) 🛛 🔤	🗸 ОК
	<ul> <li>reflection region4</li> </ul>	F4	Min(0.5, L2/2) 🛛 💀	🖌 ОК
	Device offset width	S	W/100*10 ···	🖌 ОК
	· · · · · · · · · · · · · · · · · · ·			

図17.MMIの寸法定義

🧟 Device Solver Setting 📃 🗖 🔀						
General Information So	Iver Selection   Varia	ble Selection				
Polarization						
ox (e	M ox	Y 🔽 Polarization Coupling				
Port Information Based	on Effective Index V	alues				
Port No.	Existing Modes	No. of Modes for Simulation				
Port1	1	1 /				
Port2	1					
Single Mode Width(um	); 5.2161421	<u>V</u> iew Mode Profile				
	<u>B</u> un	<u>C</u> lose 🤣 <u>H</u> elp				

図17.TEモードの解析



図18.TEモードの解析

波長とデバイス長を同時に変化させてスキャン計算を行なう。

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爆 Mesh Sett	ings Editor						
଼େଇ୍ସ୍	• • •			Mesh Color	Black 💌	Mesh Boundary Color	Aqua 🔻
View Plane	(-Z 🔹	3	< Section Pos	ition 0.0	<b>v</b>		
0.00	►Z			275.00			550.00
ᅖ Z - Horizonta	al 👔 Y - Vertica'						
×   📖 🏛	Total Size	550.00	-				
Start Position	Length No.	of Meshes Mesh 20 🗧 Unifor	Type F m ▼	tatio 1			
10	530 10	1060 Unifor	m •	1			
1							

図20.Z方向のメッシュ設定

🥵 Mesh Settings Editor	
🖓 🔍 🖳 🔳 🗐 📾 🕿 🗊 💽 📑 Mesh Color 📰 Black 💌 Mesh Bo	undary Color 📃 Aqua 🝷
View Plane Y-Z   X Section Position 0.0	
Z     Z75.00     Z75.00     Z775.00     Z775.00	
	🗸 <u>C</u> lose 🛛 🤣 <u>H</u> elp

# 図21.Y方向のメッシュ設定



図22.計算が正常に終了した状況

### ,波長をパラメータとしてL依存



図23.挿入損失とデバイス長