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(81) : , , , , , , , , , , , ,
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 EP : , , , , , , , , , , , , ,
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 (30) 60/156,768 1999 09 29 (US)
 60/199,938 2000 04 27 (US)

(71)

(14831)

(72)

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905

(74)

:

(54)

250nm 1350nm 1530nm 1625nm 가 , 1

1

1999 9 29 60/156,768 2000 4 27
60/199,938 .

가 08/559,954 .
08/559,954 ,
가 4
가 , 2.0 ps/nm - km 가 4
; 1530nm 1570nm , 1250nm
;
1530nm 1570nm 가 ;
1530nm 1625nm 2.0 ps/nm - km ,
1570nm 1625nm 0.25 dB/km 가 ,
가 가 가
가 4,715,679 .

$$A_{\text{eff}} = 2 \left(\frac{E^2 r dr}{E^4 r dr} \right)^2 / \left(\frac{D_{\text{eff}}}{D_{\text{eff}}/2} \right)^2 , \quad , \quad , \quad 0 , \quad , \quad E$$

WDM

SPM

$$, \quad \%, \quad , \quad \% = 100 \times \frac{(n_i^2 - n_c^2)}{2n_i^2} \quad , \quad , \quad n_i$$

$$1 - [\frac{b - b_0}{b_1 - b_0}] = b_i, \quad b_f, \quad \%, \quad b_o$$

$$\% = \frac{1}{(b_a) + [(b_0) - (b_a)] \{ 1 - [|b - b_0| / (b_1 - b_0)] \} } , \quad b_a \quad (b)$$

가
가
10
0.67mm
2가
5mm

0 가 #7
가 0.185mm
30N
#70
0.178mm
70N
가
가(dB/m)
가가

1530nm
1625nm
1310
1km
가

1
가
(r)%

r_0
 (r_0)
 $5.8\mu m$
 $18\mu m$
 $80\mu m^2$
 $0.20dB/km$
1550nm
(r)%

1
2
1
1
2
3 AB CD
4 EF GH

2 ,
 (r)% . , (r)% 0.8% 0.9% .
 1% 1 +/- 0.2μm = 1 .
 10μm (r₀) 9μm
 , 1550nm 1550nm 0.065 ps/nm² - km 0.067 ps/nm² - km
 100μm² 105μm² , 1550nm 0.182dB/km 0.186dB/km

3 0.6% 0.7%
 11.5μm 12.5μm . (r)%
 ((r)% , r=1 +/- 0.1μm (r)% 0.48% 0.5% , r=2 +/- 0.1μm
 0 r 5 +/- 0.2μm , r=3 +/- 0.1μm (r)% 0.24% 0.26% , r=4 +/- 0.1μm
 (r)% 0.35% 0.37% , r=5 +/- 0.1μm (r)% 0.05% 0.08% .
 , (r)% 5 +/- 0.1μm r=r₀
 , r=5 +/- 0.1μm (r)% 0.05% 0.08% .
 , r₀ 1550nm 0.066 ps/nm² - km 0.068 ps/nm² - km , 1550nm 80μm² 8
 5μm² , 1550nm 0.186dB/km 0.190dB/km .

4 0.40% 1.05%
 5.3μm 7μm , 0 r
 r₀ (r)% 5 JK LM
 1310nm 80μm² , 1550nm 0.335dB/km , 1550nm 0.25dB/km
 . 1550nm 0.22dB/km , 0.20dB/km

(r) (r)%
 . , (r)% , 0 r 6 +/- 0.2μm , r=1 +/- 0.2μm (r)%
 % 0.30% 0.40% , 0 1 +/- 0.2μm 0.8 1.2 가
 . 4 +/- 0.2μm (r)% 0.23% 0.33% 4 +/- 0.2μm r 5 +/- 0.2μm
 (r)% , 5 +/- 0.2μm (r)% 0.05% 0.15% . 5 +/- 0.2μm r 6 +/-
 0.2μm (r)% , 6 +/- 0.2μm (r)% .

5 가 1 23
 가 . ,
 . ,

1 , ,
 2 , ,

, 4 2 가 (14)
 (16) .
 5 ((J) (K) 가 18) ((L) (M) 가 22) 3
 가 5 ((N) (P) 가 20)

[1]

	D1550ps/nm - km	1550nm ^{ps/nm² - km}	MFD μ m	A _{eff} μ m ²		nm	dB	1550 dB/km	dB/m
	19.2	0.068	11.934	109	1755	12.6	0.186	0.97	
	16.8	0.061	10.677	85	1340	1.0	0.184	0.62	

, 1550nm	,	C	1530nm
1570nm	.	L	16
25nm	,	,	
2 ps/nm - km	,	0.08 ps/nm ² - km	
,	가	,	
.	.	1625nm	1625
nm	16 ps/nm - km	25 ps/nm - km	.
FWM	,	SPM	.
2	2	1	2

[2]

	D1550ps/nm - km	1550nm ^{ps/nm²} - km	MFD μm	$A_{\text{eff}} \mu\text{m}^2$	nm	dB	1550 dB/km	dB/m
	13.0	0.070	10.99	89	1599	20	0.189	0.82
	10.9	0.065	10.44	80	1187	5	0.187	0.63

3 . - OH 가 , 1310nm , 1310nm 1250nm 1
350nm .

[3]

	(nm)	(ps/nm ² - km)	MFD(μm)	(nm)	1310nm (dB/km)
	1322	0.0924	9.8	1330	0.334
	1301	0.088	8.8	1180	0.332

3 $80\mu\text{m}^2$ 3 SMF - 28
 . , 1310nm 가
 . 3 1550nm 0.188dB/km

$$3 \quad \text{가} \quad 6 \quad (24)(26) \quad . \quad (24)(26) \\ 0.8 \quad 1.3 \quad \text{가} \quad (A)(A'), \quad (B)(B'), \\ (C)(C'). \quad (D)(D') \quad .$$

1

1550nm 17.9 ps/nm - km

$$1550\text{nm} \quad 0.066 \text{ ps/nm}^2 \cdot \text{km}$$

1589 ()

1550nm 11.7 μm

1550nm 102 μm^2

1550nm 0.84dB/km

2 가 . 2 , [0.64%, 0],
 $[0.45\%, 1\mu\text{m}], [0.33\%, 2\mu\text{m}], [0.24\%, 3\mu\text{m}], [0.15\%, 4\mu\text{m}]$ [0.06%, 5.6 μm] [(r)% , r]

1550nm 11.4 ps/nm - km ;

$$1550\text{nm} \quad 0.067 \text{ ps/nm}^2 \cdot \text{km};$$

1515 (c);

1550nm 10.6μm ;

1550nm $82\mu\text{m}^2$ (A_{eff});

1550nm 0.188dB/km ; .

1530nm 1565nm, 1565nm 1625nm C L

2가

(57)

1.

1

(n_c) 가 ,

$$(r\%) = 0 \quad r = r_0 \quad , \quad r =$$

$$0 \quad (r)\% = \quad 0\%$$

0.25% o 1.0% , 5.8 μ m r₀ 18 μ m , O r r₀ ((r)%)

1550nm 80 μm^2 , 0.20dB/km

2.

1 ,

3 AB

,

3 DC

3.

2 , 1340nm 1755nm
가

4.

2 , 1550nm , 10μm 12μm ,
13dB

5.

4 , 1550nm 1 dB/m

6.

2 , 1520nm 1625nm 0.06 ps/nm² - km 0.07 ps/nm² -
km , 1550nm 16 ps/nm - km 20 ps/nm - km

7.

1 , 1550nm 85μm²

8.

1 , 1550nm 95μm²

9.

2 , 1550nm 85μm² 109μm²

10.

1 , 4 EF , 4 GH

11.

10 , 1180nm 1600nm
가

12.

10 , 1550nm , 10.5μm 11μm ,
20dB

13.

12 , 1550nm 0.9 dB/m

14.

10 , 1520nm 1625nm 0.06 ps/nm² - km 0.07 ps/nm² - km
 km , 1550nm 10.9 ps/nm - km 13 ps/nm - km

15.

10 , 1550nm 85 μm²

16.

10 , 1550nm 80 μm² 89 μm²

17.

가 ;

; ,

(n_c) 가 ,

0 (r)% = ₀ % (r)% = 0 r = r₀ (r)% = (r)% , , r =

0.8% ₀ 0.9% , 9 μm r₀ 10 μm ,

(r)% 0 r 1 +/- 0.2 μm 1 가 ,

r = 1 +/- 0.2 μm (r)% 0.35% 0.41% ,

(r)% 1 +/- 0.2 μm r r₀

18.

17 , 1520nm 1625nm 0.065 ps/nm² - km 0.067 ps/nm² - km
² - km , 1550nm 100 μm² 105 μm² , 1550nm 0.182 dB/km 0.
 186 dB/km

19.

가 ;

; ,

(n_c) 가 ,

0 (r)% = ₀ % (r)% = (r)% , , r =

0.6% ₀ 0.7% , 11.5 μm r₀ 12.5 μm ,

(r)% 0 r 5 +/- 0.2 μm ,

r=1 +/- 0.1 μm (r)% 0.48% 0.5%,

r=2 +/- 0.1 μm (r)% 0.35% 0.37%,

r=3 +/- 0.1 μm (r)% 0.24% 0.26%,

r=4 +/- 0.1 μm (r)% 0.14% 0.16%,

r=5 +/- 0.1 μm (r)% 0.05% 0.08%,

(r)% 5 +/- 0.1 μm r=r₀.

20.

19 , , 1520nm 1625nm 0.066 ps/nm² - km 0.068 ps/nm² - km², 1550nm 80 μm^2 85 μm^2 , 1550nm 0.186 dB/km 0.1 dB/km²

21.

가 ;

; ,

(n_c) 가 ,

0 (r)%= r₀% (r)%=0 r=r₀ , , r=

0.40% r₀ 1.05% , 5.3 μm r₀ 7 μm , 0 r r₀ (r)%

1310nm 80 μm^2 0.335dB/km , 1550nm 0.25dB/km

22.

21 , 5 JK , 5 LM

23.

21 , 0.40% r₀ 0.75% , 4.8 μm r₀ 6.8 μm ,

(r)% 0 r 1 +/- 0.2 μm 1 가 ,

r=1 +/- 0.2 μm (r)% 0.30% 0.40%,

(r)% 1 +/- 0.2 μm r 4 +/- 0.2 ,

r = 4 +/- 0.2 μm (r)% 0.23% 0.33% ,

(r)% 4 +/- 0.2 μm r 5 +/- 0.2 ,

r = 5 +/- 0.2 μm (r)% 0.05% 0.15% ,

(r)% 5 +/- 0.2 μm r 6 +/- 0.2 ,

6 +/- 0.2 μm (r)% .

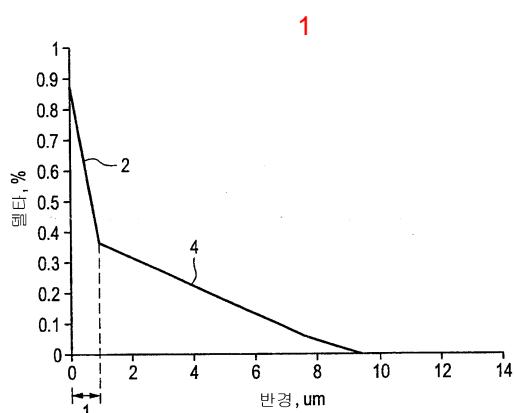
24.

가 ;

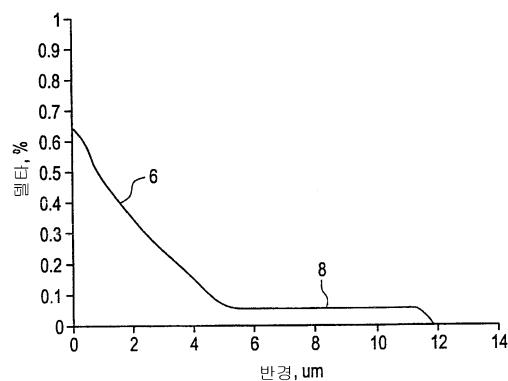
, 가 ; ,

가 1 23

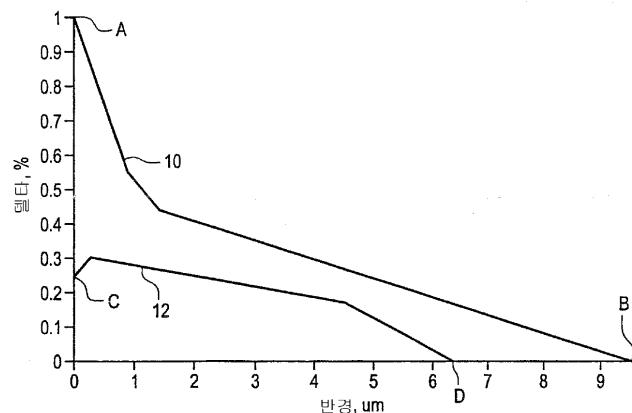
가



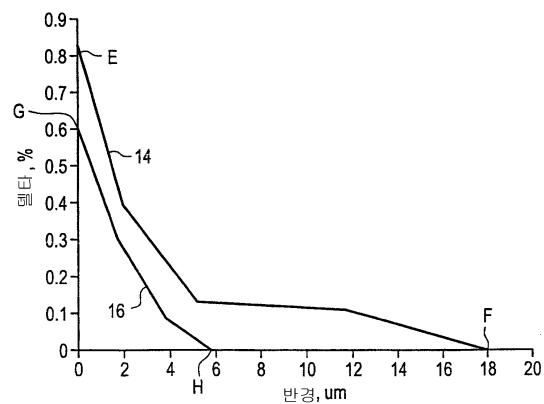
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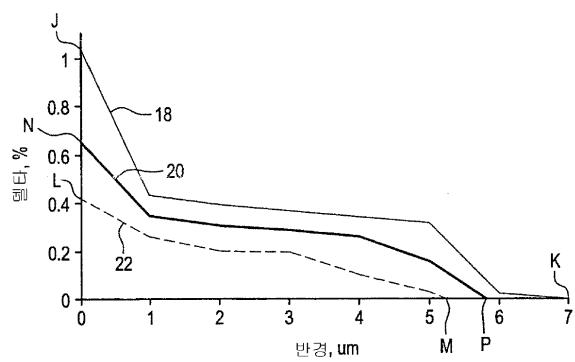
3



4



5



6

