SISTEM KOMUNIKASI OPTIK

- MATERI 5
- **DISPERSI PANDU GELOMBANG**

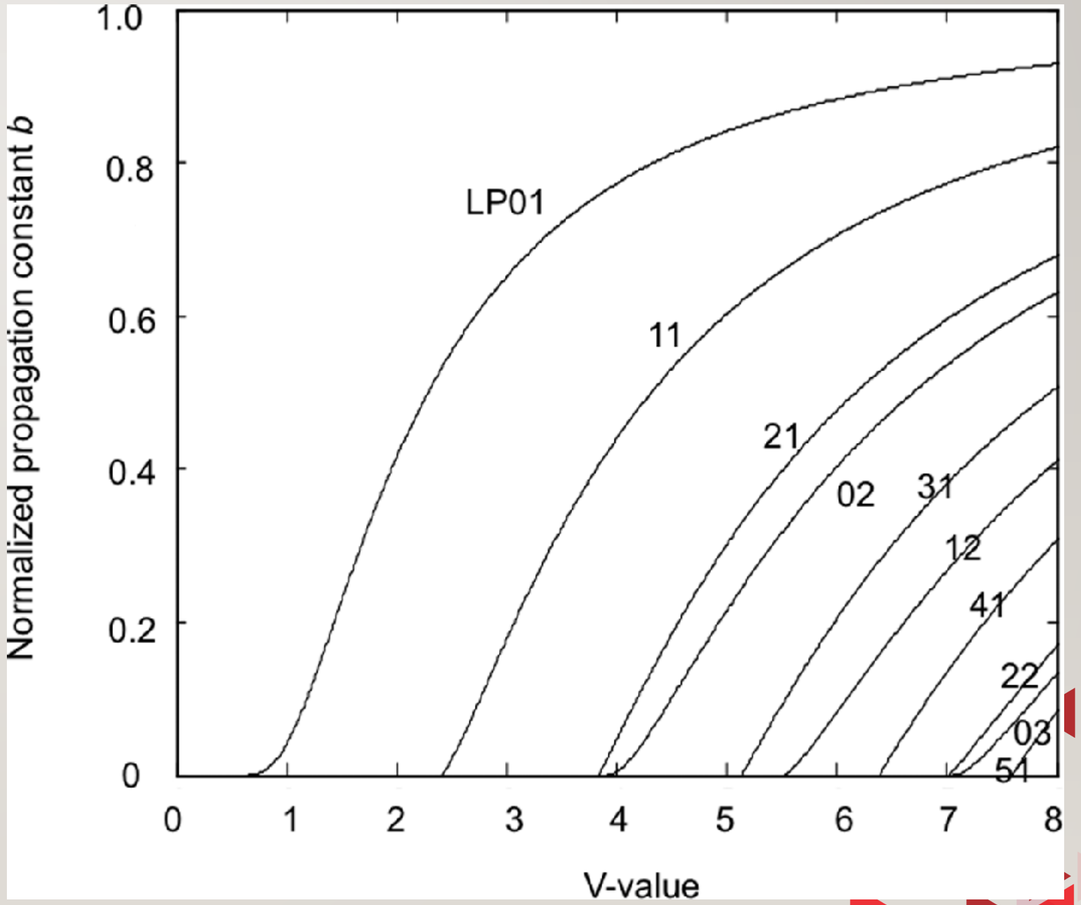
- D3 Teknologi Telekomunikasi – Fakultas Ilmu Terapan

DISPERSI PANDU GELOMBANG

$$b = \frac{\beta^2 / k^2 - n_2^{\,2}}{n_1^{\,2} - n_2^{\,2}} \approx \frac{\beta / k - n_2}{n_1 - n_2}$$ .....(Pers 1)

$$V = ka(n_1^{\,2} - n_2^{\,2})^{1/2} \approx kan_2\sqrt{2\Delta}$$ .....(Pers 2)

$$\beta \approx n_2 k(1 + b\Delta)$$ .....(Pers 3)



$$k = \frac{2\pi}{\lambda}$$

$$d^2 b / d\lambda^2 \neq 0$$

Sumber Referensi : Gerd,Keiser,2010, *Optical Fiber Communications*, 4th edition,McGraw Hill, International Edition

DISPERSI PANDU GELOMBANG

$$\tau_{wg} = \frac{L}{c}\left[n_2 + n_2\Delta\frac{d(Vb)}{dV}\right]$$ .....(Pers 4)

Parameter dispersi pandu gelombang

$$D_{pg} = \frac{d\tau_{pg}}{d\lambda} = -\frac{V}{\lambda}\frac{d\tau_{pg}}{dV} = -\frac{n_2\Delta}{c\lambda}V\frac{d^2(Vb)}{dV^2}$$ $\left(\frac{ps}{nm.km}\right)$ .....(Pers 5)

Dispersi pandu gelombang

$$\sigma_{pg} = \sigma_\lambda D_{pg} \qquad (12)$$

$$\sigma_{pg}=\sigma_\lambda D_{pg}$$ .....(Pers 6)

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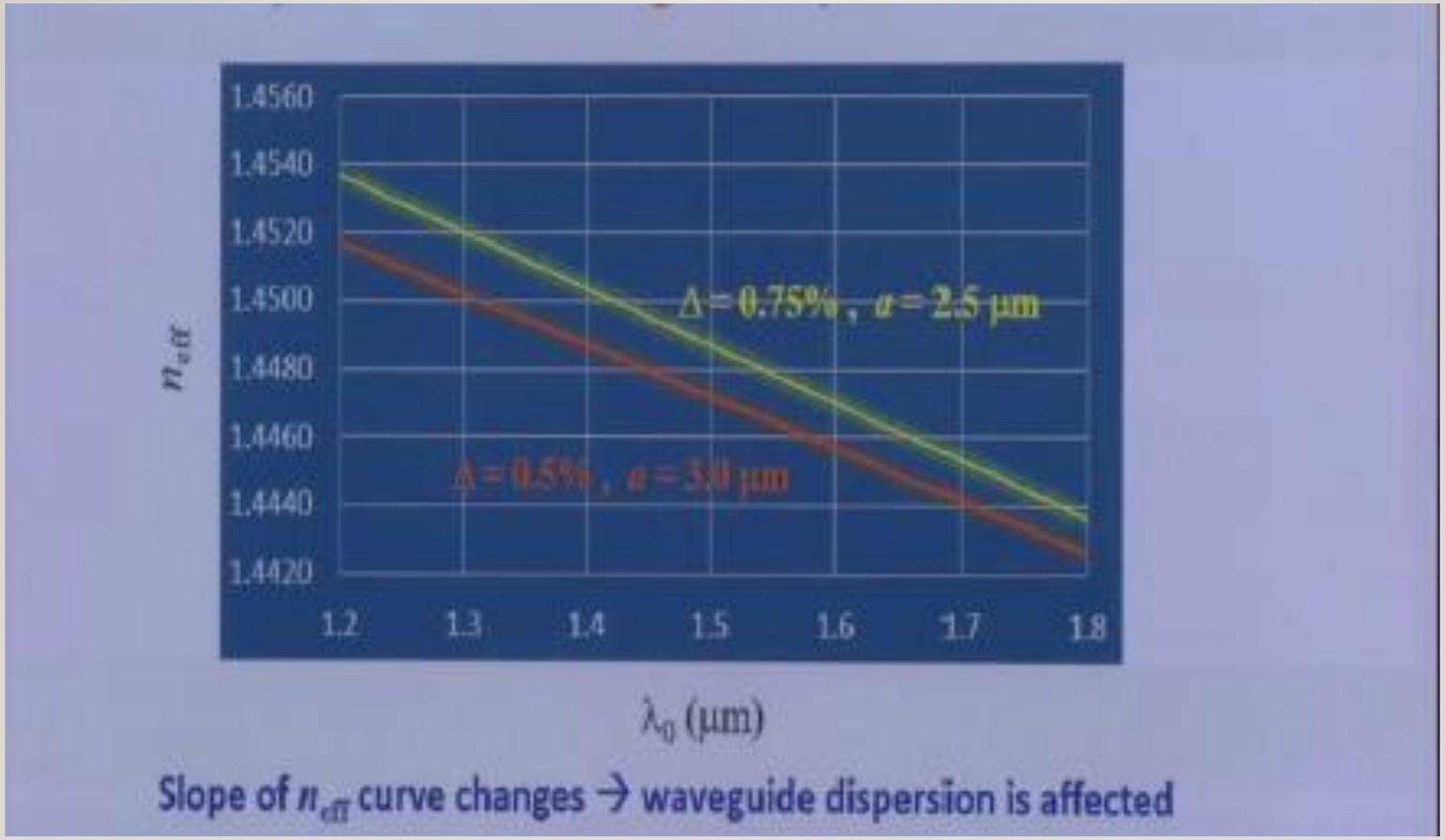
PENGARUH PARAMETER SERAT PADA DISPERSI PANDU GELOMBANG



Sumber Referensi https://nptel.ac.in/courses/115/107/115107095/

Gerd,Keiser.,2010, *Optical Fiber Communications*, 4th edition,McGraw Hill, International Edition

CONTOH SOAL

Diketahui sebuah serat optik single mode step indeks dengan nilai indeks bias inti sebesar 1.45 dan indeks bias cladding sebesar 1.444 dengan nilai jari jari serat sebesar 4.2 µm. Hitung besarnya parameter dispersi pandu gelombang pada panjang gelombang 1.55 µm?

Jawab : $V = ka(n_1^{\,2} - n_2^{\,2})^{1/2} \approx kan_2\sqrt{2\Delta}$ .....(Pers 2) $\boldsymbol{k = \frac{2\pi}{\lambda}}$

$\mathbf{V = 2.2435}$ $\boldsymbol{\Delta \cong \frac{n_1 - n_2}{n_1}}$ **= 0.0041**

$$D_{pg} = \frac{d\tau_{pg}}{d\lambda} = -\frac{V}{\lambda}\frac{d\tau_{pg}}{dV} = -\frac{n_2\Delta}{c\lambda} V \frac{d^2(Vb)}{dV^2}$$ $\left(\frac{ps}{nm.km}\right)$ .....(Pers 5)

$\boldsymbol{V\frac{d^2(Vb)}{dV^2}}$ = 0.080 + 0.549$(\mathbf{2.834 - V})^2$ = 0.2714 .....Marques Formula

$$D_{pg} = -\frac{n_2\Delta}{c\lambda} V \frac{d^2(Vb)}{dV^2} = -\frac{1.444 \,.0.0041}{3.10^8 \;\; 1.55\mu m} . 0.2714 = \mathbf{-3.48}\ \boldsymbol{\frac{ps}{nm.km}}$$

Sumber Referensi : https://www.youtube.com/watch?v=SAEQND4NyoM&t=5s
Gerd Keiser.,2010, *Optical Fiber Communications*, 4th edition,McGraw Hill, International Edition

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