

TD 3: Connaissances de transmission L3

Exercice I: Optique

1.1)

a)

$$ON = \sqrt{1,48^2 - 1,50^2} = 0,242$$

$$\text{Angle maximal} = \sin^{-1} 0,242 = 14^\circ$$

$$b) V_i = \left(\frac{2\pi a}{\lambda} \right) ON = \frac{2\pi \times 25 \cdot 10^{-6}}{850 \cdot 10^{-9}} \times 0,242 = 44,9$$

$$V_{ii} = \frac{2\pi \times 25 \cdot 10^{-6}}{1300 \cdot 10^{-9}} \times 0,242 = 29,3$$

$$c) M = \frac{V_i^2}{2}$$

$$\text{pour } d_i = 950 \text{ mm} \Rightarrow 1000 \text{ modes}$$

$$d_{ii} = 1300 \text{ mm} \Rightarrow 429 \text{ modes}$$

$$d) D_{s1} = \frac{n_1}{c} \cdot \Delta \quad \Delta = 0,0139$$

$$= \frac{1,48}{3 \cdot 10^8} \cdot \frac{n_1 - n_2}{n_1} = 6,66 \cdot 10^{-11} \text{ s.m}^{-1}$$

$$\text{Pour } 10 \text{ km, etalut d } 6,66 \cdot 10^{-7} \text{ s}$$

$$1.2) a) ON = \sqrt{1,48^2 - 1,475^2} = 0,12$$

b)

$$V = \left(\frac{2\pi a}{\lambda} \right) \times ON \quad a = \frac{240 \times 1200}{2\pi \times 0,12}$$

$$V \times d = 2\pi a \times ON \quad a = 3,76 \text{ mm}$$

$$a = \frac{V \lambda}{2\pi ON}$$

$$c) V_{1300} = 2,22$$

$$V_{1350} = 1,86$$

$$1.3) \Delta = \frac{m_1^2 - m_2^2}{2m_1^2} \approx \frac{m_1 - m_2}{m_1}$$

$$\Rightarrow ON = \sqrt{m_1^2 - m_2^2} \approx 0,256$$

$$\theta_{\max} = 14^\circ$$

$$M_x = \frac{\alpha}{\alpha+2} \times \frac{V^2}{2} = \frac{\alpha}{\alpha+2} \left(\frac{2\pi a ON}{\frac{\lambda}{2}} \right)^2$$

$$M_{(1300)} = 374$$

$$f) L_{\max} = 50 \text{ km}$$

Exercice II

$$2.1) A_0 = 32,5 + 20 \log d_{\text{km}} + 20 \log f_{\text{MHz}}$$

$$A_0 = 126 \text{ dB}$$

$$2.2) P_{\text{rdp}} = \underbrace{P_e + G_E + G_R}_{\text{PIRE}} - A_{10}$$

$$[G_R = 26 \text{ dB}] \quad \underline{G_R - 26 \text{ dB} = 10 \log |G_R|}$$

$$2.3) P_E = 4 \text{ dB}$$

$$\Rightarrow 2,5 \text{ Watt}$$

Puissance tout à fait raisonnable.

$$P_{\text{E watt}} = 10 \frac{P_{\text{dB watt}}}{10}$$

$$2.4) Z_A \neq R_C \Rightarrow \text{réflexion} \Rightarrow \text{perte de puissance}$$

$$\Gamma = \frac{Z_A - R_C}{Z_A + R_C}; P' = |\Gamma|^2 \times P$$

$$\frac{P}{P-P'} =$$

$$|\Gamma|^2 = 6,7 \times 10^{-3}$$

$$\frac{P}{P-P'} = \frac{1}{1-|\Gamma|^2} = 1,0067$$

$$10 \log(1,0067) = 0,03 \text{ dB}$$

$\Rightarrow$ 2 antennes $\Rightarrow$ 0,06 dB (négligeable)

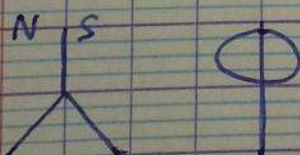
$$5) |\Gamma|^2 = 1,8 \cdot 10^{-4}$$

$$\frac{P}{P-P'} = \frac{1}{1-|\Gamma|^2} = 1,00018 \Rightarrow 0,0 \text{ dB}$$

6) On laisse comme ça.

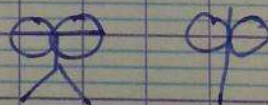
Exercice III

Antenne à polarisation
Verticale.



Omnidirectionnelle

Antenne à polarisation
horizontale.



Pour être omnidirectionnelle
il faut 2 antennes $\perp$



2) Sensibilit  utilisable

10 mV / eff / 75 Ω

$$P_R = \frac{U^2}{R} = 1,33 \mu W$$

$$P_E = 150 \text{ kW}$$

$$P_e = \frac{P_E \times G_e \times G_R}{A_0} \leftarrow \frac{(4\pi d)^2}{\lambda^2}$$