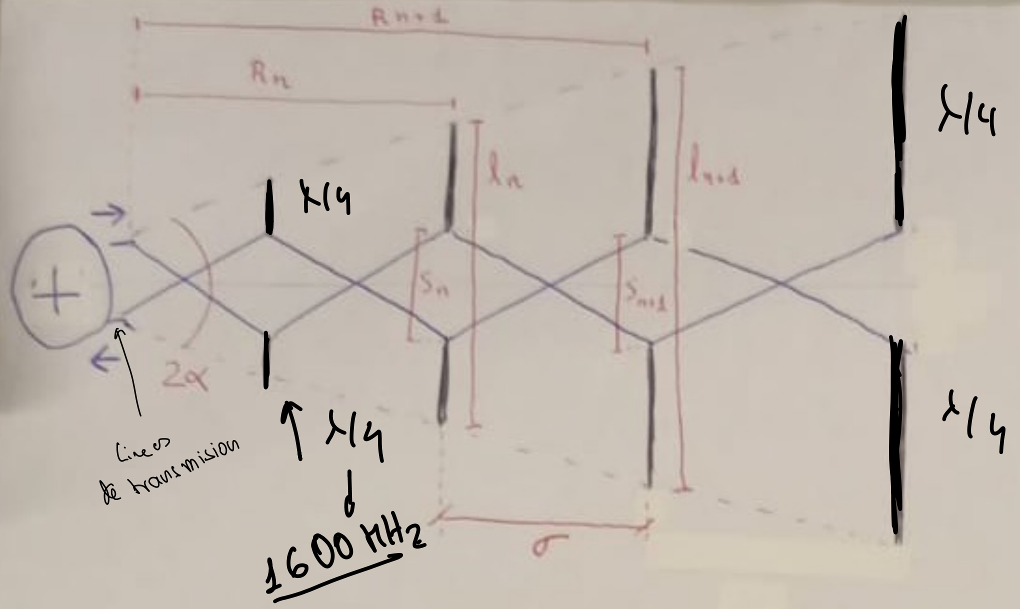


Spacing Factor: σ

$f_1 = 1200\ MHz$

$$\boxed{\frac{1}{2} = \frac{l_{n+1}}{l_n} = \frac{R_{n+1}}{R_n} = \frac{d_{n+1}}{d_n} = \frac{S_{n+1}}{S_n}}$$

$S_n \neq S_{n+1}$?
Las separaciones van aumentando?

τ = geometric ratio

$$\boxed{\sigma = \frac{R_{n+1} - R_n}{2 l_{n+1}}}$$ → Spacing factor

$$\boxed{\Delta = \ln(f_2) - \ln(f_1) = \ln\left(\frac{1}{\tau}\right)}$$

frequency span of each cycle

Ángulo apertura: 2α

$$\boxed{\alpha = \tan^{-1}\left[\frac{1-\tau}{4\sigma}\right]}$$

$$\boxed{B_{ar} = 1.1 + 7.7(1-\tau)^2 \cot\alpha}$$

Bandwidth active region

L → total length of the structure

$$\boxed{L = \frac{\lambda_{max}}{4}\left(1 - \frac{1}{B_s}\right)\cot\alpha}$$

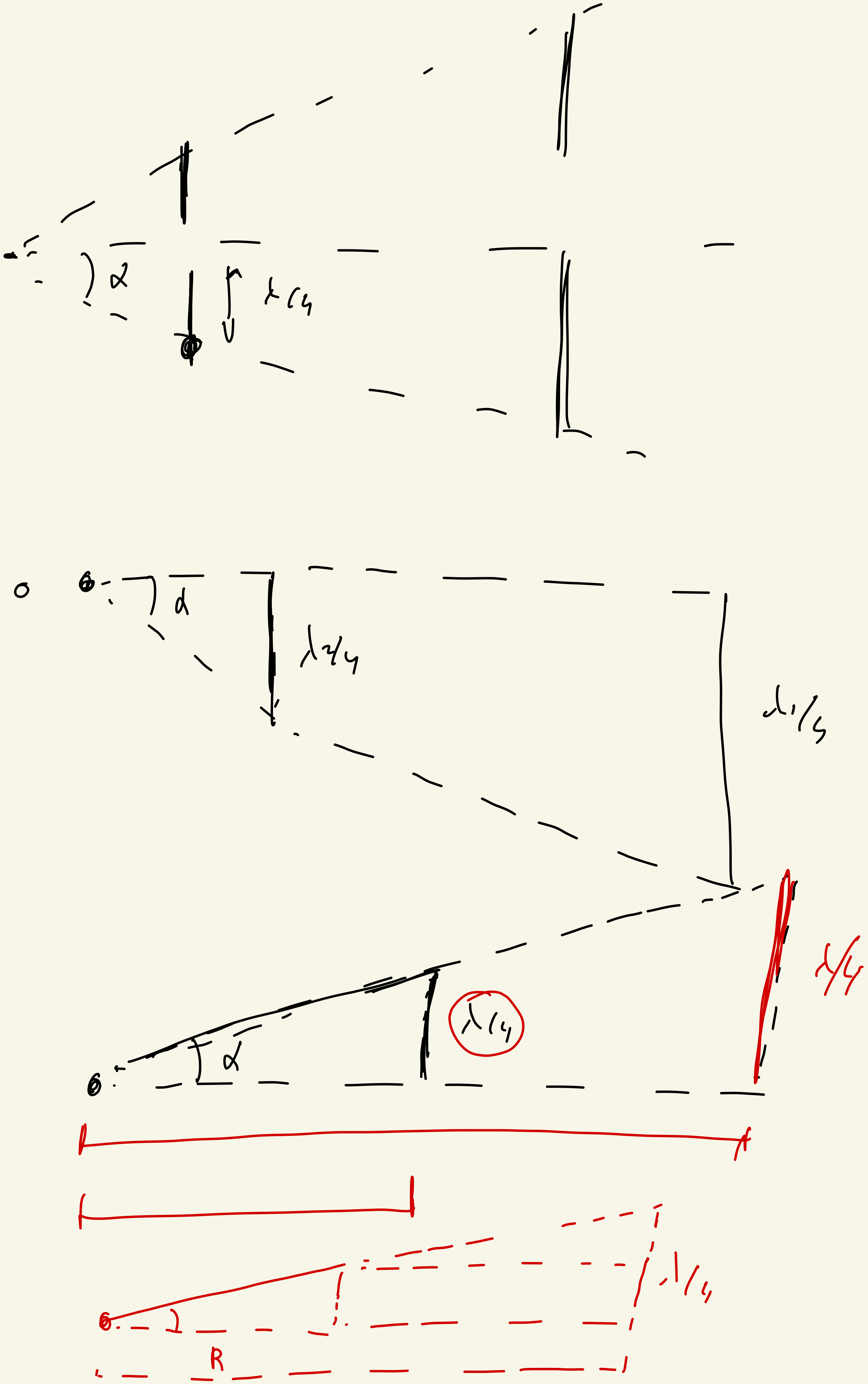
$$\left[\lambda_{max} = 2 l_{max} = \frac{v}{f_{min}}\right]$$

$$\boxed{B_s = B\left[1.1 + 7.7(1-\tau)^2 \cot\alpha\right]}$$

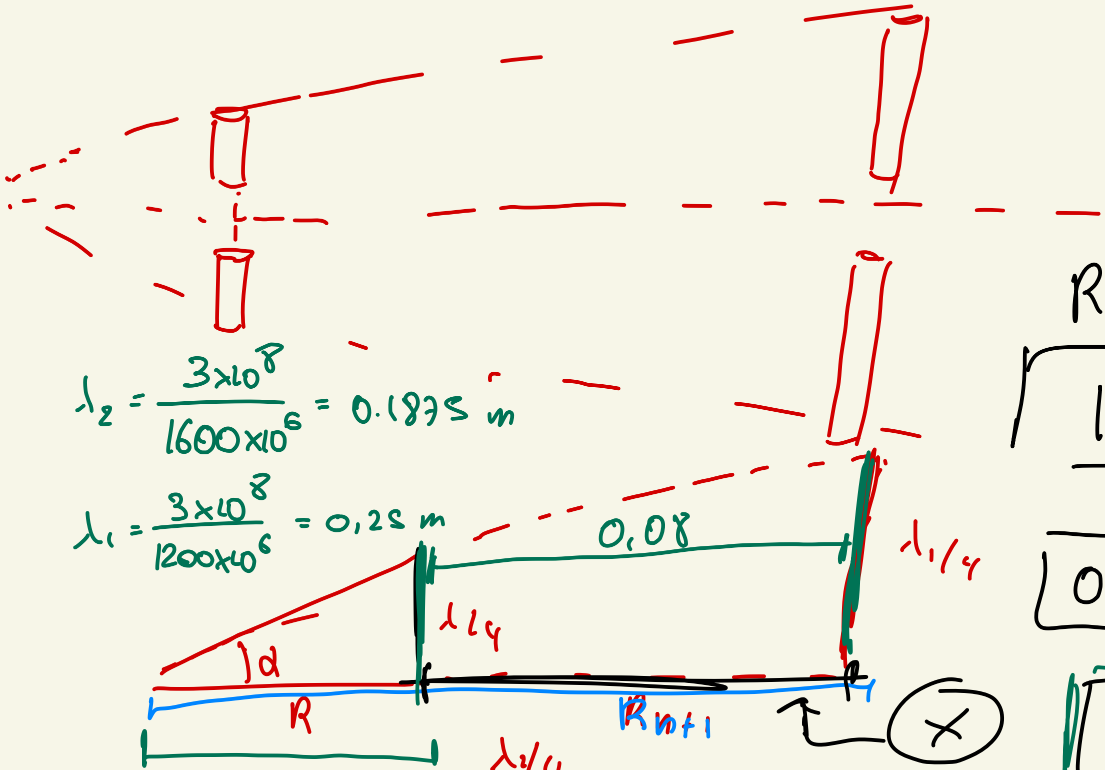
Ancho de banda un poco mayor al deseado (normalmente el que se usa para diseñar)

BW deseado

$$\boxed{N = 1 + \frac{\ln(B_s)}{\ln(1/\tau)}}$$



α
λ/4
α
λ₂/4
λ₁/4
α
λ/4
λ/4
λ/4
R



$$\lambda_2 = \frac{3\times10^8}{1600\times10^6} = 0.1875\ m$$

$$\lambda_1 = \frac{3\times10^8}{1200\times10^6} = 0,25\ m$$

Rango Alpha

$$10^\circ < \alpha < 45^\circ$$

Thao

$$0,95 \geq \eta \geq 0,7$$

$$\boxed{\alpha = 10}$$

$$tg(\alpha) = \frac{\lambda_2/4}{R}$$

$$\boxed{R = 0,26584\ m}$$

$$R_{n+1} = R + x$$

$$tg(\alpha) = \frac{\lambda_1/4}{R+x}$$

$$\frac{\frac{\lambda_1}{4}}{\frac{\lambda_2}{4}}$$

$$\frac{4}{4}\frac{\lambda_1}{\lambda_2} = \frac{\lambda_1}{\lambda_2}$$

$$\frac{\frac{\lambda_2}{4}}{R} = \frac{\lambda_1/4}{R+x}$$

$$\frac{R+x}{R} = \frac{\lambda_1}{\lambda_2}$$

$$R + x = \frac{\lambda_1}{\lambda_2} R$$

$$\boxed{x = R\left(\frac{\lambda_1}{\lambda_2} - 1\right)}$$

$$x = R\left(\frac{\lambda_1}{\lambda_2} - 1\right)$$

$$\boxed{8,86\ cm}$$

$$x = 0,265\left(\frac{0,25}{0,1875} - 1\right) = 0,0886$$

$$x = \frac{0,0886}{0,07} = 1,26 \rightarrow \boxed{1}$$

$$\sigma = P_0 \cdot \underset{\underset{\sigma}{\uparrow}}{e_e}$$

$$\boxed{P_0 = 0{,}7}$$

$$\boxed{\begin{aligned} R_{in} &= 77{,}5\ \Omega \\ d &= 10 \\ \gamma &= 0.95 \end{aligned}}$$

$$d = \operatorname{arctg}\left(\frac{1 - \gamma}{4\sigma} \right]$$

$$10^\circ = \operatorname{arctg}\left(\frac{1 - 0{,}95}{4\sigma} \right)$$

$$\tan(10^\circ) = \frac{0{,}05}{4} \cdot \frac{1}{\sigma}$$

$$\boxed{\sigma} = \frac{0{,}05}{4 \cdot \tan(10^\circ)} = \boxed{0{,}07}$$

$$\sigma = \frac{R_{n+1} + R_n}{L_{n+1}}$$

B_s = designed

B = desired → 400 MHz

$\boxed{1,2}$ → factor

Bar

$$400\,\text{MHz}\left[1{,}1 + 7{,}7(1-\tau)^2 \cot\alpha\right]$$

$$400\,\text{MHz}\left[1{,}1 + 7{,}7(1-0{,}95)^2 \cot(60°)\right]$$

$\boxed{483{,}66\ \text{MHz}}$ → B_s → designed

$$N = 1 + \frac{\ln(B_s)}{\ln(1/\tau)} \rightarrow 1 + \frac{\ln(483{,}66\ \text{MHz})}{\ln(1/0{,}95)}$$

↑ THao

$\boxed{N = 390}$ $\boxed{17 \text{ elementos}}$

$\boxed{0{,}55 \leq y \leq 0{,}7}$

$\boxed{\alpha = 10}$

$\boxed{y = 0{,}7}$

$$1{,}\hat{3}\left[1{,}1 + 7{,}7\,(1 - y)^2 \cot\alpha\right]$$

$$B_s = 1{,}\hat{3}\left[1{,}1 + 7{,}7\,(1 - 0{,}95)^2 \cot(10^\circ)\right]$$

$$B_s = 1{,}61$$

$$L = \frac{0{,}25}{4}\left(1 - \frac{1}{1{,}61}\right)\cot(10^\circ)$$

$$L = 0{,}134$$

$$N = 1 + \frac{\ln(B_s)}{\ln(1/y)} = 1 + \frac{\ln(1{,}61)}{\ln(1/0{,}95)} = 10{,}16$$

$$N = 1 + \frac{\ln(1{,}61)}{\ln(1/0{,}7)} = 2{,}3$$

$$= 1$$

$\boxed{2 \rightarrow 10}$ Rango elementos

1 | IIII

$$s > d \cosh\left(\frac{20}{120}\right)$$

Design Procedure

$$\boxed{B = \frac{f_{max}}{f_{min}}}$$

$$\boxed{D_0 \to 10{,}5\, dB}$$

1. $D_0 \longrightarrow$ Determinar $\overline{\Gamma}$ y σ $\underline{11.13}$ figura

$\overline{\Gamma}$: $\boxed{0{,}95}$ σ: $\boxed{0{,}18}$ graph

2. Determinar α usando $\boxed{11-28}$

$$\alpha = \tan^{-1}\left[\frac{1-\overline{\Gamma}}{4\sigma}\right] \quad \boxed{10^{\circ} \leq \alpha \leq 45^{\circ}}$$

$$\alpha = \operatorname{arctg}\left(\frac{1-0{,}95}{4 \cdot 0{,}18}\right) = \boxed{4^{\circ}}$$

$\underline{3{,}97}$

③ Determinar Bar

11.29 $\left[\; B_{ar} = 1.1 + 7{,}7\,(1-\overline{\Gamma})^2 \cot\alpha \;\right]$

11.30 $\left[\; B_s = B \cdot B_{ar} \;\right]$

$$B_{ar} = 1{,}1 + 7{,}7\,(1-0{,}95)^2 \cdot \frac{1}{tg\, 4^{\circ}} = \boxed{1.37}$$

$$\boxed{B = \frac{f_{max}}{f_{min}} = \frac{1600 \times 10^6}{1200 \times 10^6} = \frac{4}{3}}$$

$$\boxed{B_s = \frac{4}{3} \cdot 1,37 = 1,826}$$

(4) Encontrar L y N

$$\boxed{L = \frac{\lambda_{max}}{4}\left(1 - \frac{1}{B_s}\right)\frac{1}{tg\,\alpha}} \quad \boxed{11-31}$$

$$\boxed{N = 1 + \frac{Ln(B_s)}{Ln(1/\tau)}} \quad \boxed{11-32}$$

$$\lambda_{max} = \frac{3 \times 10^8}{1200 \times 10^6} = \underline{0,25} \ m$$

$$L = \frac{0,25}{4}\left(1 - \frac{1}{1,826}\right) \cdot \frac{1}{tg(40°)}$$

$$\boxed{L = 0,404 \ m}$$

$$N = 1 + \frac{Ln(1,826)}{Ln(1/0,95)} = 12,7 \simeq \underline{\underline{12}} \text{ o } \underline{\underline{13}}$$

(5) Determinar Z_a

$$Z_a = 120\left[Ln\left(\frac{l_n}{d_n}\right) - 2.25\right] \quad \underline{(11-33)}$$

$$\sigma' = \frac{\sigma}{\sqrt{\mathcal{L}}} = \frac{0,18}{\sqrt{0,95}} = 0,1846$$

$$l_{max} = \frac{\lambda_{max}}{2} = \frac{0,25}{2} = \underline{0,125\ m}$$

$$\frac{0,125}{12}$$

d_{max} ? $\rightarrow$ anchura $\rightarrow$ $0,2286$ $\rightarrow$ $0,01$

$$\frac{l_{max}}{d_{max}} = \frac{0,125\ (12\cdot 2)}{0,01} = \boxed{125}$$

$$Z_a = 120\left(Ln(125) - 2,25\right) = \boxed{309,40\ \Omega}$$

$$\frac{Z_a}{R_{in}} = \frac{309,4}{50} = 6,18$$

$$\frac{Z_0}{R_{in}} = 1,1 \longleftrightarrow 1,2 \qquad 1,2 = \frac{Z_0}{50}$$

$$\boxed{Z_0 = 60}$$

(7) Encontra s

$$s = d \cosh\left(\frac{20}{120}\right)$$

$$s = 0{,}01 \cosh\left(\frac{60}{120}\right) = \boxed{0{,}01127}$$