LUCIANO RUBIO ROMERO (STTR)

$A[dB] = 20\log\frac{v_2}{v_1} + 10\log\frac{R_1}{R_2}$

$A[Np] = \frac{1}{2}\ln\frac{P_2}{P_1}$ $1\,Np = 8{,}68\,dB$ $1\,dB = 0{,}115\,Np$

$\boxed{L[dBm] = L[dBu] + 10\log\frac{600}{R}}$

$L[dBr] = 10\log\frac{P_2}{P_1}$ $L[dBm] = L_0[dBm0] + L_r[dBr]$

PUNTO REF. 0 dBr [PNRO]

PRESIÓN ACÚSTICA:

$I = \frac{P^2}{Z}$ $L_p = 20\log\frac{P}{P_0} = 94 + 20\log P[Pa]$

SENSIB. MICRÓF: $S[dB(V/Pa)] = 20\log\frac{v}{P}$

SENSIB. TELÉFONO: $S[dB(Pa/V)] = 20\log\frac{P}{v}$

$\boxed{\text{MIC:}\ \Delta_{min} = \frac{1/128}{16} = \frac{1}{2^{11}}\quad \Delta_{max} = \frac{1/2}{16} = \frac{1}{2^5}}$

LUZ $400 < \lambda < 700$ (nm)
$400 < f < 700$ (THz)

$\varphi(f) = -\beta(f)\cdot d$ $\tau = \frac{d}{\text{retardo}}$

ANÁL. 1 FREC.

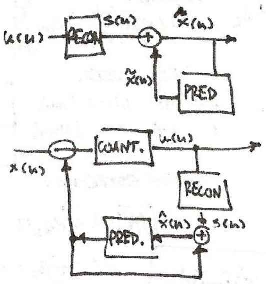
$t_{fase} = -\frac{\beta(f_0)}{\omega_0}\cdot d$

$v_{fase} = \frac{\omega_0}{\beta(f_0)}$

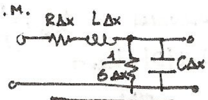
ANÁL. 2 FREC. $t_{fase_1} = \frac{\beta(f_1)}{\omega_1}\cdot d$ $t_{fase_2} = \frac{\beta(f_2)}{\omega_2}\cdot d$

$L[dBm] = 10\log\frac{P_2[mW]}{1mW}$
$L[dBW] = 10\log\frac{P[W]}{1W}$ $\Big\}\ \boxed{L[dBm] = L[dBW] + 30}$
$L[dBu] = 20\log\frac{V[V]}{0{,}775V}$ $L[dB\mu] = 20\log\frac{E[\mu V/m]}{1\mu V/m}$
$L[dB\mu V] = 20\log\frac{V[\mu V]}{1\mu V}$

CODIFICADORES PREDICTIVOS:



L.M.



$\gamma = \sqrt{(R + j\omega L)(G + j\omega C)} = \alpha + j\beta$

$\boxed{Z_0 = \sqrt{\frac{R + j\omega L}{G + j\omega C}}}$

CUANTIFI. UNIFORME $\boxed{dist = \frac{\Delta^2}{12}}$

Mejora de x dB S/dist: $10\log\left(\frac{\Delta}{\Delta'}\right)^2 = x\,dB$

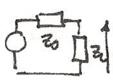
MOD. BANDA ESTRECHA: $f_0 >> W$

$t_{grupo} = \frac{\partial\beta}{\partial\omega}\Big|_{\omega=\omega_0} \cdot d$ $\boxed{v_{grupo} = \frac{\partial\omega}{\partial\beta}\Big|_{\omega=\omega_0}}$

$L_I[dB(pW/m^2)] = 10\log\frac{I[W/m^2]}{10^{-12}}$

$L_p[dB(20\mu Pa)] = 20\log\frac{P[Pa]}{2\cdot10^{-5}}$

ADAPTACIÓN:



$V_0 = E\frac{Z_L}{Z_0 + Z_L}$ POT. VECT. $\bar P = V_0 I_0^*$ POT. APAR. $P = |\bar P| = \frac{|V_0|^2}{|Z_L|}$

POT MEDIA $P_m = Re[\bar P]$

ADAPT. CONJ: MAXIMIZA la potencia transferida

$P_m = \frac{|E|^2}{4R_0}$ $Z_L = Z_0^*$ $\frac{V_0}{E} = \frac{Z_0^*}{2R_0}$

ADAPT. IMAGEN: $\boxed{P_m = \frac{|E|^2}{4R_0}\quad Z_L = Z_0}$

$\rho(L) = 0$, se evita la reflexión/distors.

$\frac{V_0}{E} = \frac{1}{2}$

DESADAPTAC:

$\rho = \frac{Z_L - Z_0}{Z_L + Z_0}$ Pérd. reflex: $R[dB] = -10\log|1 - \rho^2| = 20\log\left|\frac{Z_L + Z_0}{2\sqrt{Z_L Z_0}}\right|$

$I_0 = I_t(1 - \rho)$
$V_0 = V_t(1 + \rho)$ $P = P_t|1 - \rho^2|$

MEDIDA: $Z_0 = \sqrt{Z_a Z_c}$

$th(\gamma d) = \sqrt{\frac{Z_c}{Z_a}}$

VIDEO:

$P_{luminosa} = \frac{N_{fotones}\cdot h\cdot f}{t}$ $E = \frac{\Phi}{S}$ (iluminac) [LUX]

$I_{luminosa} = \frac{\Phi}{\Omega}$ [candela]

$Y = xR + yG + zB$
$C_R = k_R(R - Y)$ $C_B = k_B(R - B)$

MONOCROMO: 625 líneas, 25 imag/s 4:3

$T_{línea} = \frac{1}{25\cdot625} = 64\mu s$ Borrado = 12,05 μs

287,5 líneas visibles/campo $f = \frac{1}{T} = \frac{N_{elem}}{2} = 7{,}38\,MHz$

$N_{elementos} = \frac{4/3(625 - 50)\,líneas}{64\mu s - 12{,}05\mu s} = 14{,}76\cdot10^6$ elem/s

4:4:4 ×3
4:2:2 × (1 + 1/2 + 1/2)
4:1:1 × (1 + 1/4 + 1/4)
4:2:0 × (1 + 1/4 + 1/4)

PCM Muestreo 13,5 MHz Y
6,75 MHz Crom.

SISTEMA EUROPEO 4:2:2 625 líneas, 25 fps Nº muestras visibles/línea activa $\begin{cases}720\ lum.\\ 360\ crom.\end{cases}$

APROX. BAJA FREC.

$R >> \omega L$ $G << \omega C$

$\gamma = \sqrt{j\omega RC}$ $\alpha = \sqrt{\frac{\omega RC}{2}}$ $\beta = \sqrt{\frac{\omega RC}{2}}$ $Z_0 = \sqrt{\frac{R}{j\omega C}}$

APROX. ALTA FREC.

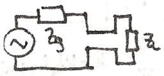
$\omega C >> R$ $\omega C >> G$

$\gamma = j\omega\sqrt{LC}$ $\alpha = \frac{1}{2}\sqrt{LC}\left(\frac{R}{L} + \frac{G}{C}\right)$ $Z_0 = \sqrt{\frac{L}{C}}$

$\beta = j\omega\sqrt{LC}$ $v_{fase} = \frac{1}{\sqrt{LC}}$

LINEA SIN PÉRDIDAS: $R = G = 0$ $\gamma = j\omega\sqrt{LC}$ $Z_0 = \sqrt{\frac{L}{C}}$

LINEA SIN DISTORSIÓN: $RC = LG$ $\alpha = \sqrt{RC}$, $\beta = \omega\sqrt{LC}$, $Z_0 = \sqrt{\frac{L}{C}}$



$P_m = Re[v(d)\cdot i^*(d)]$

si Z_0 Real $\boxed{P_m = \frac{|v_i(d)|^2}{R_0}[1 + |\rho(d)|^2]}$

$\rho(x) = \rho(L)e^{-2\gamma x}$

$\boxed{\rho(L) = \frac{Z_L - Z_0}{Z_L + Z_0}}$ $Z_L = \frac{1 + \rho(d)}{1 - \rho(d)}Z_0$

$V_0(0) = \frac{E}{Z_g + V(0)}Z(0)$ $\boxed{V(0) = V_i(0)[1 + \rho(0)]}$

$\boxed{V_i(0) = \frac{E}{2}\cdot\frac{Z(0) + Z_0}{Z(0) + Z_g}}$

CABLES DE PARES: $T_{REF} = 20°C$

$R_{cc}(t) = R_{cc}(20°C)[1 + 0{,}004(t - 20)]$ $\alpha = \frac{R}{2Z_0}$ $R \doteq \sqrt{f}$

$R_{CA}(t) = R_{cc}(t)\cdot\frac{1}{4}\left[1 + \sqrt[6]{3^6 + 8u^6}\right]$; $u = c\sqrt{\mu\sigma 2\pi f}$

COAXIALES: $T_{REF} = 10°C$

$\alpha(f) = 0{,}01 + 2{,}3\sqrt{f[M]} + 0{,}003f[M]$

$\alpha(t) = \alpha(10°C)[1 + 0{,}002(t - 10)]$

DISP. MONOMODO:

$\sigma_{INTRA} = \sigma_{MAT} + \sigma_{GO}$; $D(\lambda) = M(\lambda) + G(\lambda)$

$\sigma_{MAT} = \frac{1}{2{,}35}\cdot d[km]\cdot\Delta\lambda[nm]\cdot M(\lambda)\left[\frac{ns}{nm\,km}\right]$ [ns]

$\boxed{\sigma_{GO} = \frac{1}{2{,}35}d\cdot\Delta\lambda\cdot G(\lambda)}$ $M(\lambda) = -\frac{\lambda}{c}\frac{\partial^2 n_1}{\partial\lambda^2}$

$G(\lambda) = -\frac{1}{c}\frac{1}{4\pi^2 a^2 n_1}$ (<0 SIEMPRE)

$B = \frac{0{,}44}{\Delta\lambda\cdot d\cdot|D(\lambda)|}$

FIBRA:

$\boxed{V = \frac{2\pi a}{\lambda}\sqrt{n_1^2 - n_2^2}}$ frec. norm. $\boxed{\begin{matrix}V < 2{,}405 \rightarrow 1\,MODO\\ V > 2{,}405 \rightarrow MULTIMODO\end{matrix}}$

$\Delta = \frac{n_1^2 - n_2^2}{2n_1^2} \approx \frac{n_1 - n_2}{n_1}$

$\boxed{AN = \sqrt{n_1^2 - n_2^2}}$

$\theta_{ic} = arcsen\left(\frac{n_2}{n_1}\right)$ ANG. ACEPTAC. $n_0\,sen\,\theta_a = \sqrt{n_1^2 - n_2^2}$

VENTANAS:
1. MULTI 850
2. MULTI 1300
3. MONO 1310
4. MONO 1550

$\boxed{B = \frac{0{,}187}{\sigma}}$

DISP. MULTIMODO:

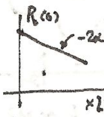
$\boxed{\sigma^2 = \sigma_{MOD}^2 + \sigma_{MAT}^2}$

$\boxed{\sigma'_{MOD} = \frac{0{,}187}{B}}$ $\sigma_{MOD} = d^\gamma\cdot\sigma'_{MOD}$

$\begin{cases}d < L_c & \gamma \approx 1\\ d > L_c & 0{,}5 < \gamma < 0{,}6\\ & 0{,}7 < \gamma < 0{,}8\end{cases}$

UNIÓN: A_e—A_e $\alpha_e = \frac{A_e[dB]}{d_{canal}[Km]}$ [dB/Km]

REFLECTOM. $P_b(x) = P_i(0) + B - 2\alpha d$ [dBm] [dBm] [dB] [dB]



PÉRD. INSERCIÓN $l_{ic} = \frac{P_i(L)}{P_0(d)} > 1$

PÉRD. RETORNO $l_{rc} = \frac{P_i(d)}{P_0(d)} >> 1$

TX RADIO:

$\Phi = \frac{P_t}{4\pi d^2}$; $P_r = \frac{\lambda^2}{4\pi}\Phi$

$P_r = P_t\left(\frac{\lambda}{4\pi d}\right)^2$

$g = \frac{\Phi_{ant}}{\Phi_{isótropa}}$

PÉRDIDAS BÁSICAS:

$l_{bf} = \frac{P_t}{P_r} = \left(\frac{4\pi d}{\lambda}\right)^2 \equiv \boxed{92{,}45 + 20\log(f[GHz]) + 20\log(d[Km])}$

$l_f = l_{bf}\frac{1}{g_t\cdot g_r}$ $L_f = L_{bf} - G_t - G_r$

PROPAGAC. SUP. TERRESTRE:

$a_e = \left(\frac{e_0}{e}\right)^2$; $A_e = 10\log a_e$

$l = l_{bf}\cdot\frac{a_e}{g_t\cdot g_r}$; $L = L_{bf} - G_t - G_r + A_e$

MODELO ~~LSI~~ SLI

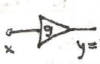
$V_{prop} = c$; $\varphi(f) = -\omega d/c$

$H(f) = \frac{\lambda}{4\pi d}\sqrt{g_t g_r}\cdot e^{-j\omega d/c}$

PROPAG. MULTITRAY.

$h(t) = a[\delta(t - t_0) + \delta(t - t_0 - \tau)]$

$|H(f)| = 2a\,|sen(\pi f t)|$



$y = \sqrt{g}\,x$ $g = g_v^2$

ANÁLIS. 1 TONO:

$\boxed{v_n = \frac{1}{2^{n-1}}\cdot a_n\cdot v^n}$

COEF. DIST. $\boxed{d_n = \frac{v_n}{v_1}}$; $D_n = 20\log d_n$

COEF. DIST. GLOBAL $d = \sqrt{\Sigma d_i^2}$ $A_n = -D_n$

$P_n[dBm] = nP_1[dBm] + M_n^*$

$M_n^* = 10\log\left[m_n\left(\frac{R}{1000}\right)^{n-1}\right]$ $m_n = \left(\frac{v_n}{v_1^n}\right)^2$

ANÁLISIS 2 TONOS:

Fundam: f_1, f_2
armónicos: nf_1, nf_2
Prod. interm: $kf_1 \pm lf_2$ (orden k+l)

$V_{in} = \frac{n}{2^{n-1}}a_n v^n = nv^n$

Coef. INTERM. $i_n = \frac{v_{in}}{v_1} = nd_n$

$I_n[dB] = D_n + 20\log n$

ANÁLIS. 3 TONOS:

fundam. armónicos
continua.
Intermod.
Intermod. a±b±c

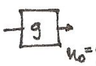
AUTOEXP. $\frac{3}{4}a_3\left[A^3\cos + B^3\cos + C^3\cos\right]$

EXPANS. CRUZADA $\frac{3}{2}a_3\left[A(B^2 + C^2)\cos + B(A^2 + C^2)\cos + C(A^2 + B^2)\cos\right]$

RUIDO TÉRMICO:

$\langle i_n^2\rangle = \frac{4ktb}{R}$

$\langle v_n^2\rangle = 4ktbR$



$n_0 = gn_i + n_{int}$
$= gkt_0b + kt_e bg$ $\boxed{t_e = \frac{n_{int}}{gkb}}$ $\boxed{n_{int} = g\,kt_e b}$

$\boxed{f = \frac{t_{at}}{t_0}\ 1 + (a - 1)\frac{t_{at}}{t_0}}$

$\boxed{f = 1 + \frac{n_{int}}{gn_i} = 1 + \frac{t_e}{t_0}}$; $\boxed{t_e = t_0(f - 1)}$

Si $t_{at} = t_0 \Rightarrow \boxed{f_{at} = a}$ $\boxed{t_{at} = t_0(a - 1)}$

CADENA CUADRIP.

$\boxed{\begin{matrix}t_{e_T} = t_{e1} + \frac{t_{e2}}{g_1} + \frac{t_{e3}}{g_1 g_2} + \dots \frac{t_{eM}}{g_1 g_2\cdots g_{M-1}}\\ f_T = f_1 + \frac{f_2 - 1}{g_1} + \frac{f_3 - 1}{g_1 g_2} + \dots + \frac{f_M - 1}{g_1 g_2\cdots g_{M-1}}\end{matrix}}$

$n_0 = n g_1 g_2\cdots g_M + (kt_{eT}b)g_1 g_2\cdots g_M$

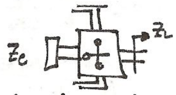
t_f

$\boxed{n_0 = k[t_e + t_f]b\cdot g}$ $\boxed{t_e = (t_f + t_{ea})\cdot g_a + t_{eb}}$

$t_{e(salida)} = k(t_f + t_{eT})b\,\frac{g_1 g_2\cdots}{a_1 a_2\cdots}$

Luciano Rubio Romero http://www.loociano.com | Chuletario STTR (Sistemas de Transmisión) | junio 2008

ATENUAC. EQUILIBRIO A_R



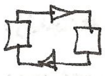
ATEN. TRANS. $A_{tt}[dB] = 7 + A_R$

$A_R[dB] = 20\log\frac{1}{\rho} = 20\log\left|\frac{Z_E+Z_L}{Z_E-Z_L}\right|$

$0 \leq A_R \leq \infty$

DESADAP. ADAPT. TOTAL

PÉRDIDAS ENTRE EXTREMOS 2H



$T[dB] = 7 + \sum L - \sum G$

$M = 2(T + A_R)$

Margen canto $S[dB] = \frac{M}{2} = T + A_R \geq 3dB$

GENERACIÓN ECOS:

Eco respecto al que habla:

Eco respecto escucha

$t_\Delta = 2(a_A + T) + A_R$

$A_E = 2(t_A + t)$

$t_\Delta = 2t_2$

$A_E = 2(T + A_R)$

$v_{TX} = \frac{1}{T_S}$

$R_b = \frac{\log_2 M}{T_S}$

$\boxed{b_{PAM} = \frac{R(1+\alpha)}{2\log_2 M}}$

$\boxed{b_{QAM} = \frac{R(1+\alpha)}{\log_2 M}}$

Sensib. nominal $S[dBm]$ $P_E \leq P_{E_{obj}}$

Sensib. efect. $S_{ef}[dBm] = S_0 + I$

$\boxed{\frac{S}{N} = \frac{E_S/T_S}{N_0 b}}$ $\quad \eta_{PAM} = \frac{2\log_2 M}{1+\alpha}$

$\boxed{\frac{E_S}{N_0} = \frac{S}{N}(1+\alpha)}$ $\quad \eta_{QAM} = \frac{\log_2 M}{1+\alpha}$

DISEÑO SECC. REG.

$dist_{RS\,max} = \min\{d_{MAX\,RES}, d_{MAX\,Sef}\}$

$d_{MAX\,RES}$ $I\begin{cases}1dB & \sigma_{F0} < 0{,}2T \\ 2dB & \sigma_{F0} < 0{,}498T\end{cases}$

POWER. P.

$PP = 10\log\left(\frac{\gamma'}{\gamma}\right) = 10\log\left(\frac{P'_{op}}{P_{op}}\cdot\frac{\sigma_1}{\sigma'_1}\right)$

$\boxed{d_{MAX\,Sef}\quad P_R = P_T - \left[2\alpha_c + d_{MAX}(\alpha + \alpha_e)\right] + P.P. - M_S - I \geq S}$

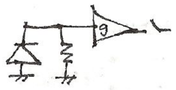
	LED	LASER	
$\Delta\lambda$	40	0,1 – 1	[nm]
P	< -6	> -6	[dBm]

$\boxed{i_S = n_e \cdot e = \eta \cdot n_f\, e = \frac{\eta e}{hf}\cdot P_{op} = r \cdot P_{op}}$

$\boxed{i_P = M i_S}$

$\boxed{S = \frac{P_{op_1} + P_{op_0}}{2}}$

RX ÓPTICO:



$P_e = Q\left(\frac{v_{S1} - v_{S0}}{\sigma_1 + \sigma_0}\right) = Q\left(\frac{1}{2}\sqrt{SNR_1}\right)$

γ

$SNR_1 = \frac{(v_{S1} - v_{S0})^2}{\sigma_1^2}$

BANDA ESTRECHA:

$\sqrt{|\beta_2|}\cdot d < k_{RX}\cdot T$

$D = -\frac{\omega}{\lambda}\beta_2 = -\frac{2\pi c}{\lambda^2}\beta_2$

DESVANECIMIENTO

$P(desv > F[dB]) = k_0 \cdot 10^{-F/10}$

$\boxed{\begin{array}{l}\text{RUIDO TÉRMICO} \\ \{i_t^2\} = \frac{4kt}{R_L} \quad \langle i_t^2\rangle = \frac{4ktb}{R_L} \\ \langle v_t^2\rangle = 4kt\cdot R_L\, bg\end{array}}$

$\boxed{\eta_{ASE} = \frac{f\cdot h\cdot g\cdot U}{2}}$

$\boxed{\{i_{ASE}^2\} = 4r^2 \cdot P_{op}\cdot \eta'_{ASE}}$

$\boxed{\eta'_{ASE} = \eta_{ASE_1}\frac{1}{a}g_2 + \eta_{ASE_2}}$

BANDA ANCHA

$\frac{1}{2{,}35}\Delta\lambda \cdot d\,|D| < k_{RX}\cdot T$

$k_{RX}: \begin{cases} I = 1dB & 0{,}2 \\ I = 2dB & 0{,}498\end{cases}$

$\boxed{\begin{array}{l}\text{RUIDO GRANALLA:} \\ \{i_g^2\} = 2e(i_S + i_{OS})M\cdot F(M) \\ \langle i_g^2\rangle = \{i_g^2\}b \Rightarrow \langle v_g^2\rangle = 2eb(i_S + i_{OS})M\cdot F(M)\cdot R_L^2\cdot g\end{array}}$

$g_{PARÁBOLA} = k\frac{\pi^2 D^2}{\lambda^2}$

$RIP_{CC} = \frac{\min(s)}{\max(i)} = \frac{\frac{KP_t}{R^\alpha}}{\frac{KP_t}{D^\alpha}} = \left(\frac{D}{R}\right)^\alpha$

$\boxed{\begin{array}{l}\text{RUIDO AMP.} \\ \{v_a^2\}\ ;\ \langle v_a^2\rangle = \{v_a^2\}\cdot bg\end{array}}$

$\boxed{\frac{\gamma'}{\gamma} = \sqrt{\frac{P'_{op1}}{P_{op1}}}} \Rightarrow P'_{op1} = P_{op1} + x\,dB$

$G = 20{,}4 + 10\log k + 20\log f + 20\log D$

TOTAL:

$\sigma_n^2 = \left[2e(i_S + i_{OS})MF(M)R_L^2 + 4ktR_L + \{v_a^2\}\right]bg$

$\frac{\gamma'}{\gamma} = \frac{(v_{S1}/\sigma'_1)}{(v_{S1}/\sigma_1)} = \sqrt{\frac{P'_{r1}}{P_{r1}}}$

$P_r = \Phi\cdot\frac{\lambda^2}{4\pi}g_r = \Phi\cdot S_e \quad S_{boca} = \pi\left(\frac{D}{2}\right)^2$

$\begin{array}{l}RPI_{CC}\\ [dB]\end{array} = \left[\text{Pot señal deseada} - \begin{array}{l}\text{Pot señal cocanal}\\ \text{interf}\end{array}\right]_{min}$

Pot. en carga:

$v(L) = v_i(L)[1 + \rho(L)] = v_i(0)e^{-\gamma_1 L}[1 + \rho(L)]$

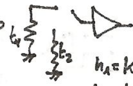
$i^*(L) = \frac{v_i^*(L)}{Z_{01}^*}(1 - \rho(L)) = \frac{v_i^*(0)}{Z_{01}^*}e^{-\gamma_1 L}(1 - \rho(L)^*)$

$P_m = \mathrm{Re}\left[\frac{|v_i(0)|^2}{Z_{01}^*}e^{-2\alpha_1 L}(1 - |\rho(L)|^2 + j2\,\mathrm{Im}[\rho(L)])\right] \overset{Z_{01} = R_{01}}{=} \frac{|v_i(0)|^2}{R_{01}}e^{-2\alpha_1 L}(1 - |\rho(L)|^2)$

$\boxed{v_i(d) = v_i(0)e^{-\gamma d}}$

$\rho_g = \frac{Z_g - Z_0}{Z_g + Z_0}$, $A_t = 20\log\left|\frac{v}{v\rho(d)e^{-\gamma d}\rho_g\cdot e^{-\gamma d}}\right| = 20\log\frac{e^{2\alpha d}}{|\rho(d)\rho_g|}$

2 medidas



$n_1 = kt_1 bg + n_{int}$

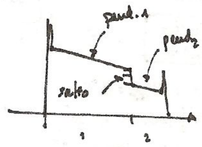
$n_2 = kt_2 bg + n_{int}$

$n_{int} = kt_e bg$

MIC 30 canales (2 pares)

2048 Mbps

64 kbps → canal



DISP. CROMÁTICA NULA:

$0 = D_1\cdot d_1 + D_2\cdot d_2$

$\boxed{\sigma = \frac{\Delta\lambda\, d\, D(\lambda)}{2{,}35}}$

$\boxed{\sigma_T < 0{,}2T}$ MONOMODO $I = 1dB$

$\boxed{\sigma_T < 0{,}498T}$ $I = 2dB$

$\alpha_1 = \frac{\text{pend}_1}{2}$ $\quad A_e = \frac{\text{salto}}{2}$

$\alpha_2 = \frac{\text{pend}_2}{2}$

$P_{tx} = S + [\alpha_1 d_1 + \alpha_2 d_2 + 2A_c + A_e]$

INTERMOD:

$\boxed{\underset{\text{TOTAL}}{n_{i_2}} = M\cdot\underset{\text{indiv.}}{n_{i_2}}\cdot 10^{2L_T/10}}$

$\boxed{n_{TOTAL}[mWo] = n_{TOT}[mW]\,10^{-L_T/10}}$

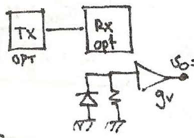
$\boxed{\underset{\text{total}}{n_{i_3}} = M^2\cdot\underset{\text{indiv.}}{n_{i_3}}\cdot 10^{3L_T/10}}$

M secciones compensadas

$t_e \simeq M t_0\cdot af$

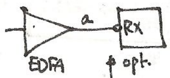
$\sigma^2 = |\beta_2|z$

$\beta_2 = -\frac{\lambda^2 D}{2\pi c}$



$v_0 = i_S\cdot g_v\cdot R$

$i_S = r P_{op}$



EDFA η_{ASE} opt.

$\{i_{ASE}^2\} = 4r^2 P_{op}\,\eta$

$\boxed{\eta = \frac{\eta_{ASE}}{a}}$

Imagen TV repetida:

$v_{fase} \Rightarrow \Delta t = \frac{2d}{v_{fase}}$

64 µs/línea

Si $d(m)$ → Se exploran $d(m)$ en 52 µs ¿d? en Δt DESPLAZAM.

MARGEN DESVANECIM. M_n

$M_n \Rightarrow P_e = 10^{-n} \Rightarrow \gamma \ldots \Rightarrow S = Th_G$

ej: $\boxed{M_G = P_R - Th_G}$

GRANALLA:

$\langle i_g^2\rangle = 2e(i_S + i_{OS})\cdot b$

$\langle v_{g(1)}^2\rangle = 2e(i_S + i_{OS})R^2(g_v)^2$

$\sigma_{(1)}^2 = \langle v_{g(1)}^2\rangle \Rightarrow \sigma(1) = \sqrt{\langle v_{g(1)}^2\rangle}$

$L_{RC} = \frac{1}{B(H-1)}$

$L_{\substack{\text{RETORNO}\\\text{CONECTOR}}} = \frac{1}{10^{\frac{B(dB)}{10}}\left(10^{\frac{H(dB)}{10}} - 1\right)}$