Problem Statement:

Write a prgrem to plot ratio of output power to the input power is frequency for different carrier recombination life time.

→ 1) Given $P_{dl} = 300\ mW$

$\tau = 5\,ns$

$$P_e(w) = \frac{P_{dl}}{[1 + (\omega\tau_i)^2]^{1/2}}$$

$f = 20\ MHz$

$$P_e(20MHz) = \frac{300\ mW}{[1 + (2\times\pi\times 20m\times 5n)^2]^{1/2}}$$

$$= 254.019$$

$f = 100\ MHz$

$$P_e(100\ MHz) = \frac{300\ mW}{[1 + (2\pi\times 100m\times 5n)^2]^{1/2}}$$

$$= 90.99$$

$f = 200\ MHz$

$$P_e(200\ MHz) = \frac{300\ mW}{[1 + (2\pi\times 200m\times 5n)^2]^{1/2}}$$

$$= 47.153$$

2) $B_{opt} = \frac{\sqrt{3}}{2\pi\tau}$

$$= \frac{\sqrt{3}}{2\pi\times 5n}$$

$$= 53.13\times 10^6\ (mHz)$$

$B_{elect} = \frac{B_{opt}}{\sqrt{2}}$

$$= \frac{55.13\times 10^6}{\sqrt{2}}$$

B ELECT = 39.99×10^6 (MHz)

3) $\tau_i = 2ns$

a) est f = 20MHz

$$Pe(20MHz) = \frac{300 \times 10^{-6}}{[1 + (2\pi \times 20 \times 10^{-6}$$

Pe (20MHz) = 290.95 μW

b) est f = 100MHz

$$Pe(100MHz) = \frac{300 \times 10^{-6}}{[1 + (2\pi \times 100 \times 10^{-6}$$

Pe (100MHz) = 186.803 μW

c) est f = 200MHz

$$Pe(200MHz) = \frac{300 \times 10^{-6}}{[1 + (2\pi \times 200 \times 10^{-6}$$

Pe (200 MHz) = 110.91 μW

$$B_{opT} = \frac{\sqrt{3}}{2\pi}$$

$$= \frac{\sqrt{3}}{2\pi \times 2 \times 10^{-9}} = 137.832 \text{ MHz}$$

$$B_{elect} = \frac{B_{opT}}{\sqrt{2}}$$

$$B_{elect} = \frac{137.832 \times 10^6}{\sqrt{2}} \rightarrow 97.462 \text{ MH}$$

and electrical bandwidth for the device

3. Also evaluate all the above parameters at 2 ns.

Average carrier recom-	Output Power at 20 MHz	at 100 MHz	at 200 MHz	optical BW	Electrical BW
5 ns	254.01	90.99	47.15	55.13	39.98
2 ns	290.95	186.80	110.90	137.93	97.46