

COMP7005

Assn03

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1.

$$\begin{aligned} & ((4 * \pi * 2450000000 \text{hz} * 1000\text{m}) / 3 \times 10^8)^2 \\ L(p) &= 10531964518.673577797 \\ & 100.225093873\text{dB} \\ & 100.2\text{dB} \end{aligned}$$

$$\begin{aligned} P(t) &= 15\text{dBm} - 30 \\ &= -15\text{dB} \end{aligned}$$

$$\begin{aligned} G(t) &= 9\text{dBi} \\ G(r) &= 9\text{dBi} \\ L(ct) &= 3\text{dB} \\ L(cr) &= 3\text{dB} \end{aligned}$$

$$\text{RSL} = -15\text{dB} + 9\text{dBi} - 100.2\text{dB} + 9\text{dBi} - 3\text{dB} - 3\text{dB}$$

$$\begin{aligned} \text{RSL} &= -103.2\text{dB} \\ \text{RSL} &= -103.2\text{dB} + 30 \\ &= -73.2\text{dBm} \end{aligned}$$

No, there is not enough of a margin for the system to work reliably, because the access point requires at least -50dBm for reliable function.

2. (a)

$$\begin{aligned} & ((4 * \pi * 2450000000 \text{hz} * 200\text{m}) / 3 \times 10^8)^2 \\ L(p) &= 10531964518.673577797 \\ & 421278580.746943112 \\ & 86.25\text{dB} \end{aligned}$$

$$P(t) = 13\text{dBm} - 30 = -17\text{dB}$$

$$G(t) = 1.5\text{dBi}$$

$$G(r) = -1.5\text{dBi}$$

$$\begin{aligned} P(r) &= -17\text{dB} + 1.5\text{dBi} + (-1.5\text{dBi}) - 86.25\text{dB} \\ &= -103.25\text{dB} + 30 \\ &= -73.25\text{dBm} \end{aligned}$$

$$\begin{aligned} &= 10^{(-73.25 / 10)} \\ &= 0.000000047315 \text{ mW} \\ &= 4.7 * 10^{-8} \text{ mW} \end{aligned}$$

2. (b)

$$((4 * \pi * 2450000000 \text{hz} * 2000\text{m}) / 3 \times 10^8)^2$$

$$L(p) = 10531964518.673577797$$

$$42127858074.694311189$$

$$106.25\text{dB}$$

$$P(t) = 13\text{dBm} - 30 = -17\text{dB}$$

$$G(t) = 1.5\text{dBi}$$

$$G(r) = -1.5\text{dBi}$$

$$P(r) = -17\text{dB} + 1.5\text{dBi} + (-1.5\text{dBi}) - 106.25\text{dB}$$

$$= -123.25\text{dB} + 30$$

$$= -93.25\text{dBm}$$

$$= 10^{(-93.25 / 10)}$$

$$= 0.0000000047315 \text{ mW}$$

$$= 4.7 * 10^{-10} \text{ mW}$$

2. (c)

The receiver in question (a) with distance 200m will work.

However the receiver in question (b) with distance 2000m will NOT work.

2. (d)

a.

$$((4 * \pi * 2450000000 \text{hz} * 200\text{m}) / 3 \times 10^8)^2$$

$$L(p) = 10531964518.673577797$$

$$421278580.746943112$$

$$86.25\text{dB}$$

$$P(t) = 13\text{dBm} - 30 = -17\text{dB}$$

$$G(t) = 15\text{dBi}$$

$$G(r) = -1.5\text{dBi}$$

$$P(r) = -17\text{dB} + 15\text{dBi} + (-1.5\text{dBi}) - 86.25\text{dB}$$

$$= -89.75\text{dB} + 30$$

$$= -59.75\text{dBm}$$

$$= 10^{(-59.75 / 10)}$$

$$= 0.000001059 \text{ mW}$$

$$= 1.06 * 10^{-6} \text{ mW}$$

b.

$$((4 * \pi * 2450000000 \text{hz} * 2000\text{m}) / 3 \times 10^8)^2$$

$$L(p) = 10531964518.673577797$$

$$42127858074.694311189$$

$$106.25\text{dB}$$

$$P(t) = 13\text{dBm} - 30 = -17\text{dB}$$

$$G(t) = 15\text{dBi}$$

$$G(r) = -1.5\text{dBi}$$

$$P(r) = -17\text{dB} + 15\text{dBi} + (-1.5\text{dBi}) - 106.25\text{dB}$$

$$= -109.75 + 30$$

$$= -79.75\text{dBm}$$

$$= 10^{(-79.75 / 10)}$$

$$= 0.00000001059 \text{ mW}$$

$$= 1.06 * 10^{-8} \text{ mW}$$

c.

The modified receiver from question a. at 200m will work as well as the modified receiver from question b. at 2000m. They both function at a reliable rate.