# dB - dBm

dBm : decibel milliwatt.

Power P. $\longrightarrow$ Convert into milli watts

$P \longrightarrow P_{mw}$

$10\log_{10} P_{mw} \rightarrow$ dBm.

" Examples.

- 100 KW (Typical power of FM station).

  $100 KW \longrightarrow 100 \times 10^3 \times 10^3 \, mw$
  $= 10^8 \, mw$

  $10\log_{10} 10^8 = 80 \, dBm$

- 2W (GSM phones)

  $2W \longrightarrow 2 \times 10^3 \, mw$

$$= 10\log_{10} 2 + 10\log_{10} 10^3$$

$$\simeq 3 + 30$$

33 dBm.

3G Phone – 500 mw.

= 27 dBm

802.11 b/g Transmit power.

100 mw

= 20 dBm

– maximum receive power of 802.11 b/g

≈ 100 μw.

= −10 dBm

→ Minimum Rx power required

≈ 0.1 Pw

= −100 dBm.

– 0.178 femtowatt (GPS receiver)

= −127 dBm.

# dB: Relative scale

Ratio between two power.

$P_1$ & $P_0$

$$10 \log \frac{P_1}{P_0}$$

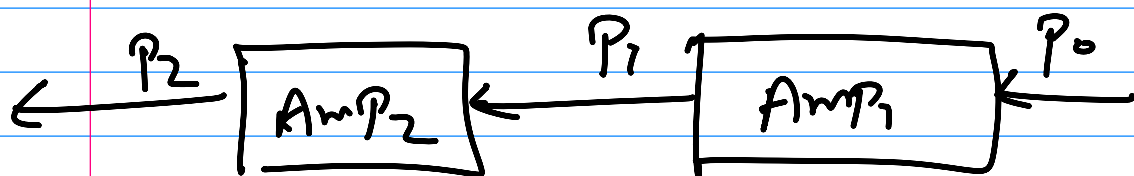
Ex: GSM Phone $\quad\quad$ 802.11 b/g

2w $\quad\quad$ 100mw

$$10 \log_{10} \frac{2w}{100mw}$$

$$= 13 \text{ dB}$$

— x/




$$G_1 = 10 \log_{10} \frac{P_1}{P_0} \quad \text{dB}$$

$$G_2 = 10 \log_{10} \frac{P_2}{P_1} \quad \text{dB}$$

Total gain $= G_1 + G_2$

$dB + dBm \Rightarrow dBm$

$dB + dB \Rightarrow dB$.

## Specification of Wireless Standards

① Frequency bands & channelization.

Ex: Bluetooth: 2.4 GHz ⟷ 2.480 GHz.

① 1 MHz / user

≃ 80 users.

② Data rates → Constant
→ Variable

– Modulation

③ FDD / TDD

(4) Tx output power.

(5) Tx: Spectral mask.

(6) Rx - Sensitivity

(7) Rx - Input Range
(dynamic Range)

IEEE 802.11a.

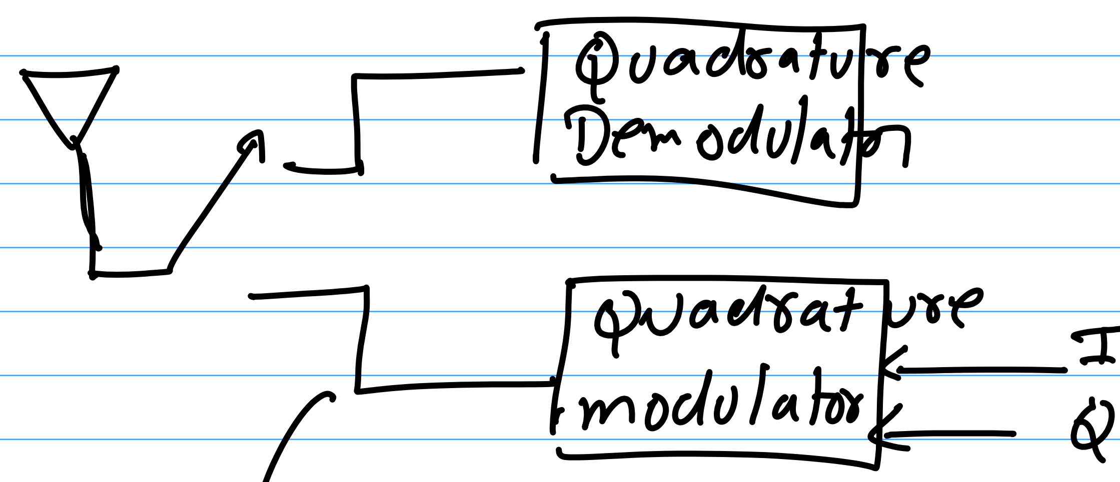
maximum data rate: 54 mbps

BW: 20 MHz.

$f_c$ = C.F = 5 GHz.

modulation: Digital OFDM..

Tx power: 20 dBm



↓

5.15 – 5.35 GHz

5.725 – 5.825 GHz