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Q 1. Two carriers are 10 MHz apart with C1 at 895 MHz IM3_1 is at 885 MHz and IM3_2 is at 915 MHz what is the frequency of C2?

**Ans:** Since Intermodulation Carrier Frequency propagates and defined integer multiple of each other,

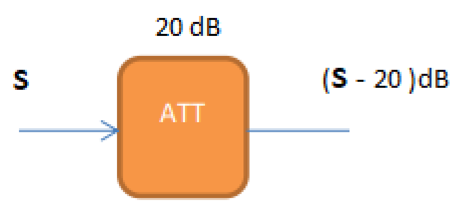
In the given scenario were:

C1 = 895 MHz with a 10 MHz apart from C2,

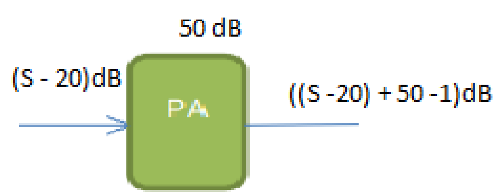
C2 = C1 + 10 MHz = 905 MHz

Q 2. In the diagram below, the PA has a gain of 50 dB and a 1dB compression point of 52 dBm. The attenuator at the input of the PA provides 20 dB of attenuation. Assuming lossless cables and ideal instruments/components, how much input power does the source need to achieve an output power of 52 dBm?

Ans: At the attenuator:




At the Amplifier:




But dB = dBm + 10 $\log_{10}(10^{-3})$

=52 dBm + (-30)

=22 dB

So;

22 dB = ((S-20) + 50-1)

S = -7dB

-7dB = (-7+30) dBm = 23dBm

So, to achieve an output power of 52 dBm, the source needs an input power of about 23dBm.

3. A signal of 100 watts (50 dBm) is sent through a lossless coaxial cable to an antenna with a return loss of 10 dB. How much power is radiated by the antenna? How much power will be radiated if the return Loss is 3 dB? How much power will be radiated if the return Loss is 7 dB?

$$RL = 10log_{10}\frac{P_f}{P_r}$$

**For a return loss of 10 dB:**

$$10 = 10log_{10}\frac{P_f}{P_r}$$

Where: $P_f$ = 100 W; $P_f$ = forward Power; $P_r$ = radiated Power

$$10 = 10log_{10}\frac{100}{P_r}$$

$$log^{-1}(\frac{10}{10})=\frac{100}{P_r}s$$

$$10=\frac{100}{P_r}$$

$P_r$ = 10 W

$$\therefore \text{Power transmitted by the antenna @ 3dB} = P_f - P_r = 100 - 10 = 90 \text{ watts}$$

**For a return loss of 3 dB:**

$$3 = 10log_{10}\frac{P_f}{P_r}$$

Where: $P_f$ = 100 W; $P_f$ = forward Power; $P_r$ = radiated Power

$$3 = 10log_{10}\frac{100}{P_r}$$

$$log^{-1}\left(\frac{3}{10}\right) = \frac{100}{P_r}$$

$$1.9953 = \frac{100}{P_r}$$

$P_r$ = 50.11 W ≈ 50 W

$$\therefore \text{Power transmitted by the antenna @ 3dB} = P_f - P_r = 100 - 50 = 50 \text{ watts}$$

**For a return loss of 7 dB:**

$$7 = 10log_{10}\frac{P_f}{P_r}$$

Where: $P_f$ = 100 W; $P_f$ = forward Power; $P_r$ = radiated Power

$$7 = 10log_{10}\frac{100}{P_r}$$

$$log^{-1}\left(\frac{7}{10}\right) = \frac{100}{P_r}$$

$$5.012 = \frac{100}{P_r}$$

$P_r$ = 19.95 W ≈ 20 W

$$\therefore \text{Power transmitted by the antenna @ 3dB} = P_f - P_r = 100 - 20 = 80 \text{ watts}$$

Q 4. Perform a program that adds two vectors (magnitude and phase) and stores them in a third vector, Use the next libraries: System; System.Collections.Generic; System.Linq; System.Text;