Tutorial 5

Chapter 12

11. If a COHO with a carrier frequency of 300 MHz has a maximum thermal frequency drift of +/− 20 ppm/degree C and the STALO with a carrier frequency of 9.2 GHz has a maximum thermal frequency drift of +/− 2 ppm/degree C, which oscillator contributes the most frequency drift when the ambient temperature changes from 72 degrees F to −20 degrees F?

12.

a. What frequencies are produced at the RF port of a mixer if the two input frequencies are 1.5 GHz into the IF port and 7.8 GHz into the LO port? Consider all harmonics of both input signals up to and including the second harmonic and sums and differences of all harmonics.

b. If the desired output signal is the one at 9.3 GHz, how close is the closest undesirable signal above the desired frequency and below the desired frequency (in MHz)?

c. If the instantaneous bandwidth of the signal at 7.8 GHs is 1 GHz, do any of the undesirable signals enter an ideal 1 GHz wide band-pass, filter centered at 9.3 GHz?

d. If a filter having the characteristics shown in Figure 12-17 is used to suppress undesired signals by at least 24 dB, how many sections will be required for the filter for 3 dB bandwidth of 1 GHz? Assume all signals are less than 10 MHz bandwidth.

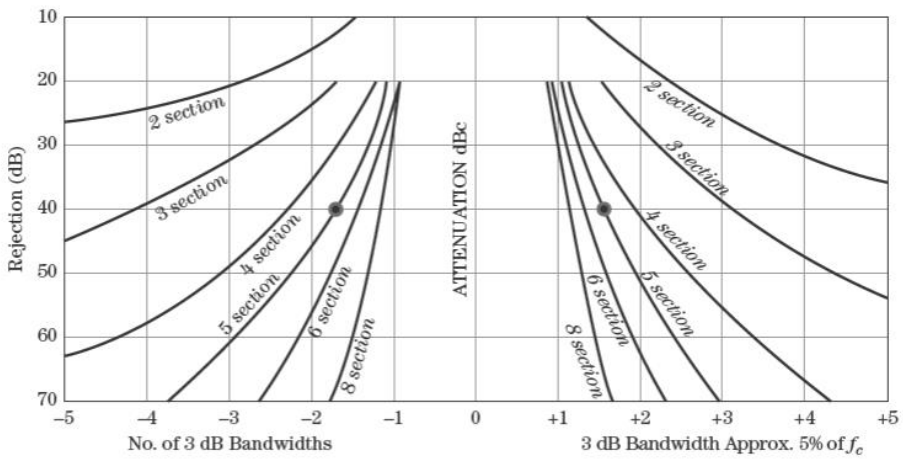

FIGURE 12-17 ■ Filter characteristics for a typical 5% bandwidth tubular filter. (Courtesy Lark Engineering [4]. Used with permission.)

13. Using Figure 12-17, if you need to pass signals in the 3 dB passband from 5.85 to 6.15 GHz and suppress unwanted signals below 5.55 GHz and above 6.45 GHz by 50 dB, what is the fewest number of sections the filter must have? If the rejection requirement is reduced to –40 dB, can a filter with fewer sections be used? (How many sections would be required for this case?)

14.

a. Using Figure 12-12, if the STALO or COHO signal into the network is at +7 dBm, what is the amplitude of the signal at the output of the filter? The following lists specify the salient features of the devices.

Switches:

Insertion loss		0.7 dB
Isolation		23 dB
Switching speed		25 ns maximum
Maximum power		100 dBm

Mixer:

Conversion loss:	IF-to-RF	6 dB
	LO-to-RF	6 dB
IF		2.0–4.0 GHz
LO frequency		2.0–10.0 GHz

Filter:

Passband insertion loss	1.5 dB

b. If an amplifier is used at the output of the filter in (a), how much gain must the amplifier have to provide at least +10 dBm signal into the following transmit amplifier?

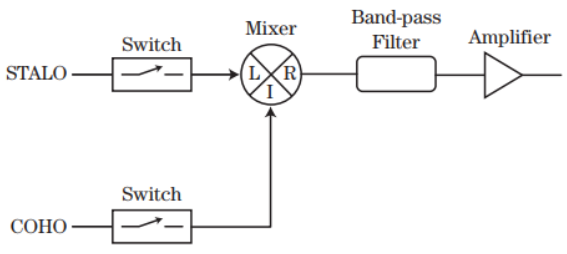

FIGURE 12-12 ■ Method for pulsing the transmit frequency using switches.