

Homework 8 Solutions

4.8-1

$f_c = 1500 \text{ kHz}$ for AM signal

$$f_{IF} = 455 \text{ kHz}$$

IF RF filter is poor, what other AM carrier, f , will also allow $f_c = 1500 \text{ kHz}$ to be heard?

If tune superhet. to f , then $f_{LO} = f + f_{IF}$.

If modulate carrier at f_c with f_{LO} , then get components at $f_{LO} \pm f_c$.

For what value(s) of f does $f_{LO} \pm f_c$ lie at f_{IF} ?

$$f_{LO} \pm f_c = \pm f_{IF} = f + f_{IF} \pm f_c$$

$\uparrow$ $+$ is not interesting, so use $-$.

$$f + 2f_{IF} \pm f_c = 0 \Rightarrow f = f_c - 2f_{IF} = 1500 - 2(455) = \boxed{590 \text{ kHz}}$$

4.8-2

Carrier $1 \leq f_c \leq 30 \text{ MHz}$, $f_{IF} = 8 \text{ MHz}$

$$LO: f_{LO} = f_c + f_{IF} \in [9, 38] \text{ MHz}$$

$$\text{Consider } f_c = 10 \text{ MHz} \Rightarrow f_{LO} = 18 \text{ MHz}$$

What other carrier, f , is heard if no RF filter?

$$f_{LO} \pm f = \pm f_{IF} \Rightarrow 18 \pm f = \pm 8$$

What $f \in [1, 30]$ satisfies this?

$$\boxed{f = 26 \text{ MHz}}$$