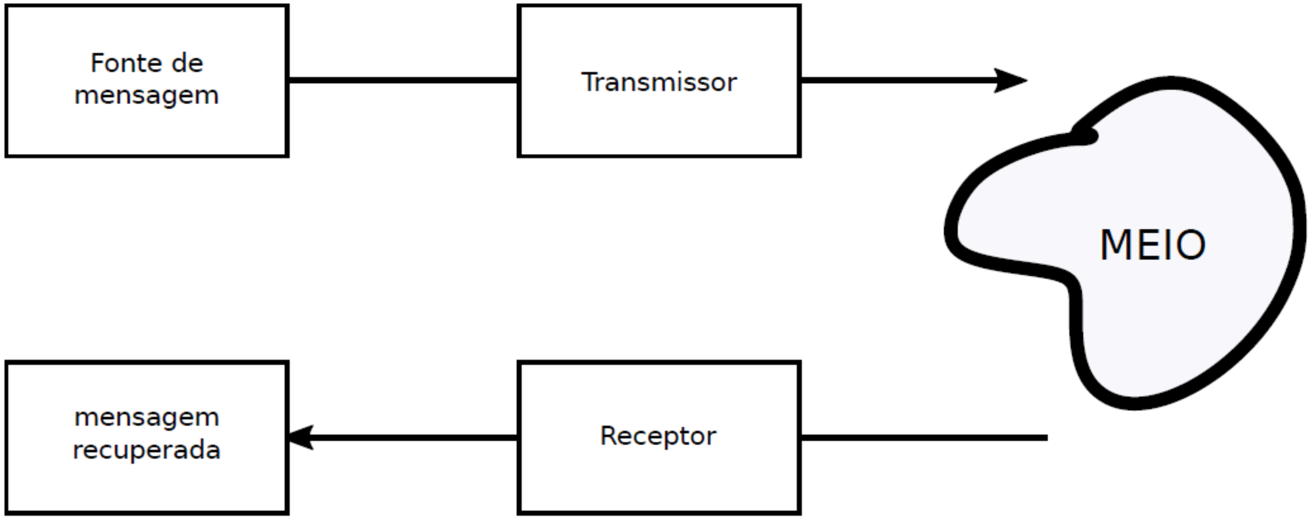
Camada Física da Computação

Projeto 8 - Modulacao AM

2018 – Engenharia da computação

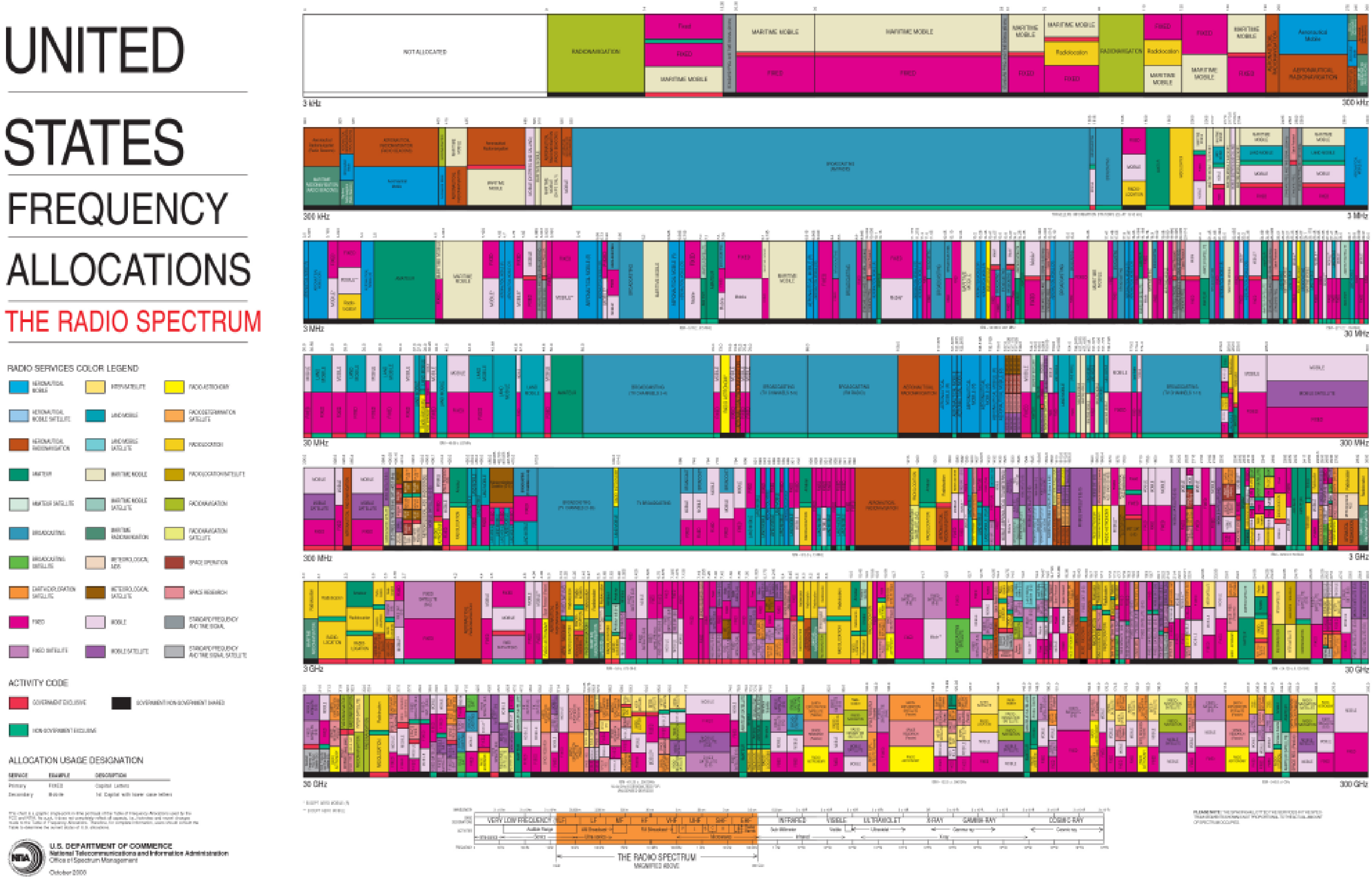
Rodrigo Carareto

Várias fontes, vários receptores, bandas passantes...

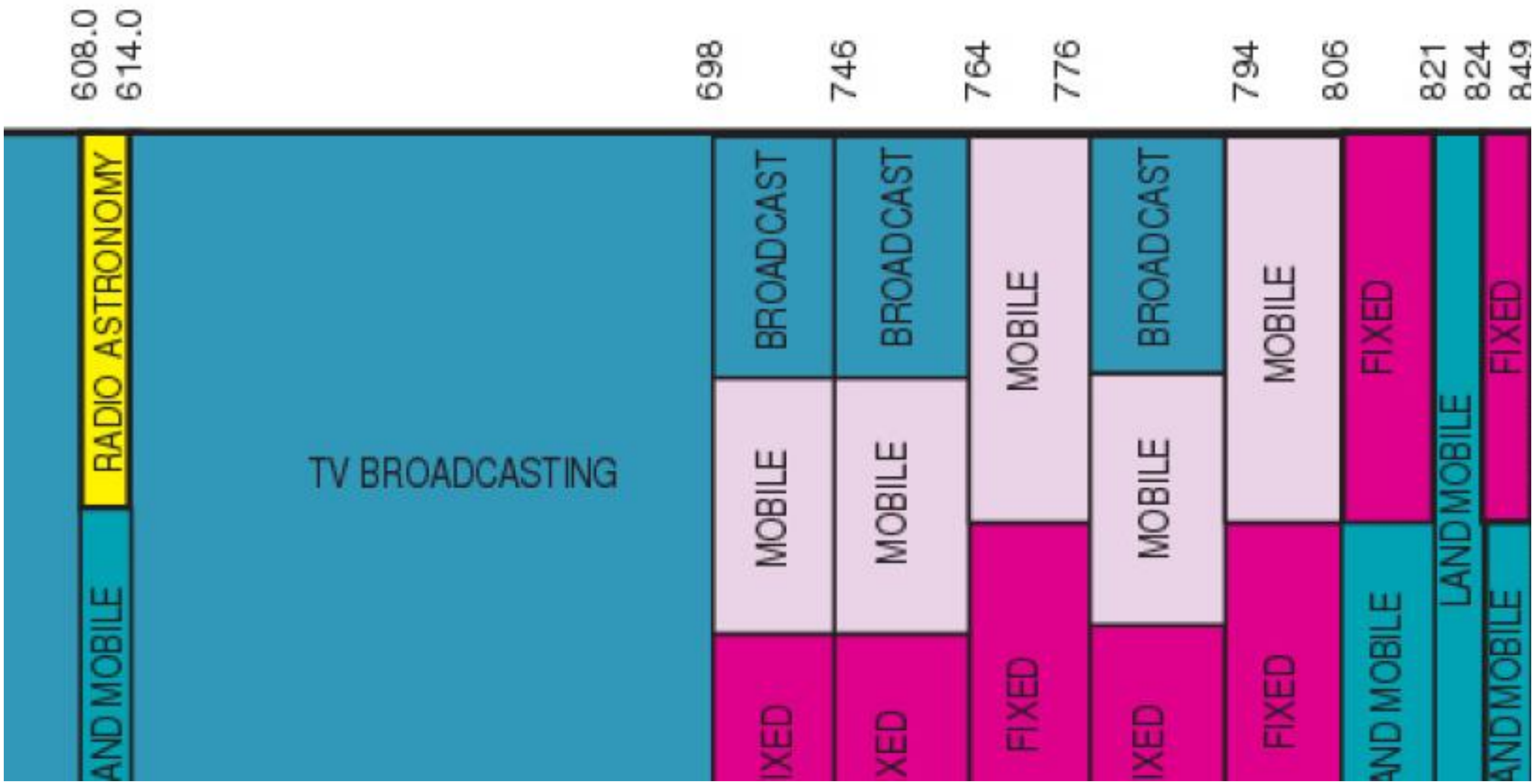


O problema a ser enfrentado: vários emissores, vários receptores

Bandas americanas



Bandas americanas



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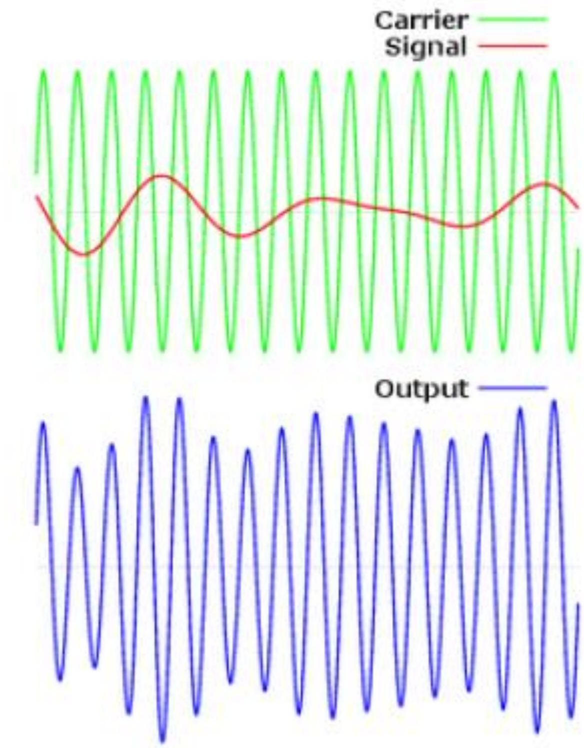
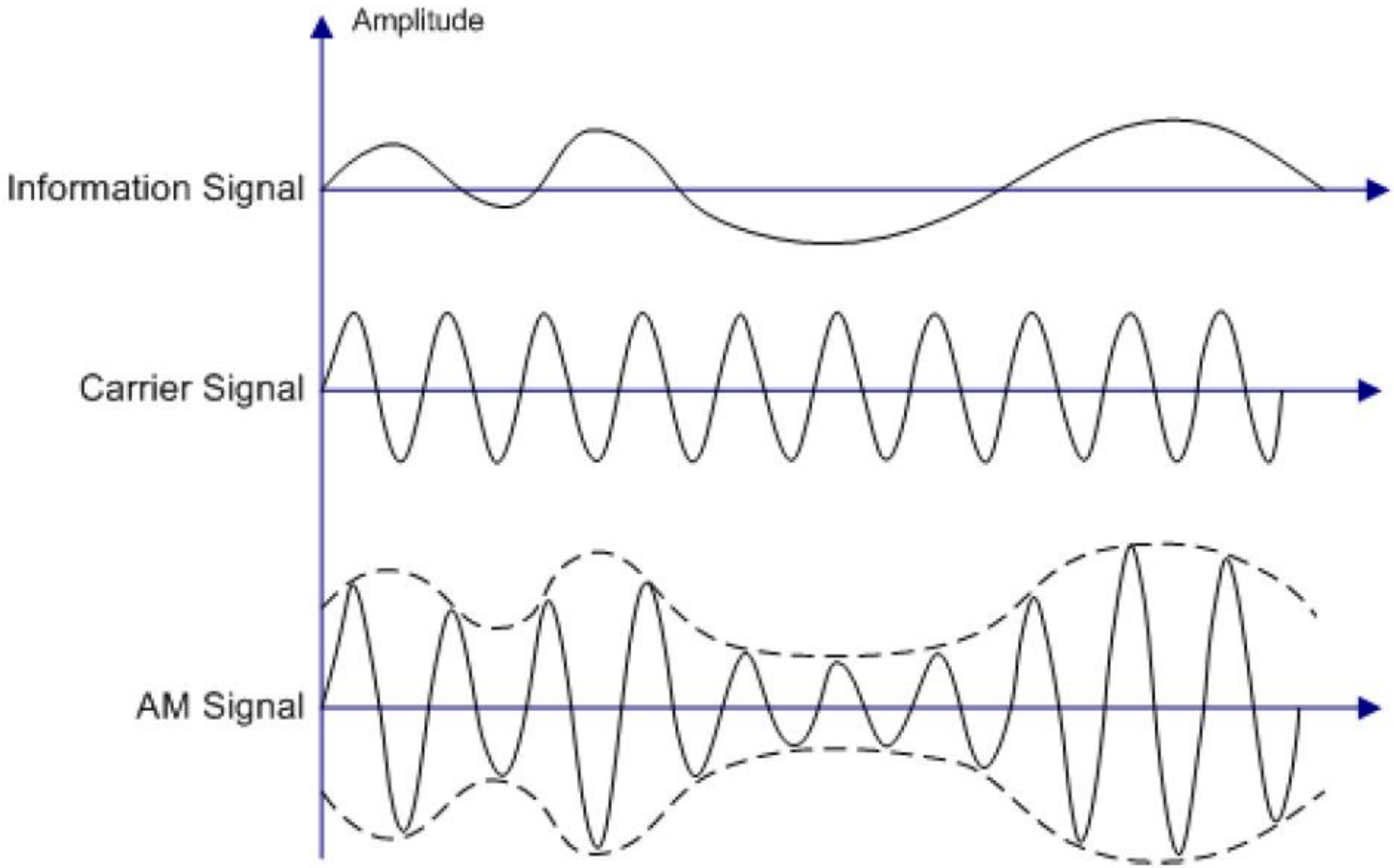
Como colocar informação em uma frequência única de recepção?



Modulação AM



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Modulação AM

- $m(t) = A_m \cos(2\pi f_m t)$
- $C(t) = A_c \cos(2\pi f_c t) f_c \gg f_m$
- $$\begin{aligned} S(t) &= [1 + m(t)]C(t) \\ &= C(t) + m(t)C(t) \end{aligned}$$

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Modulação AM

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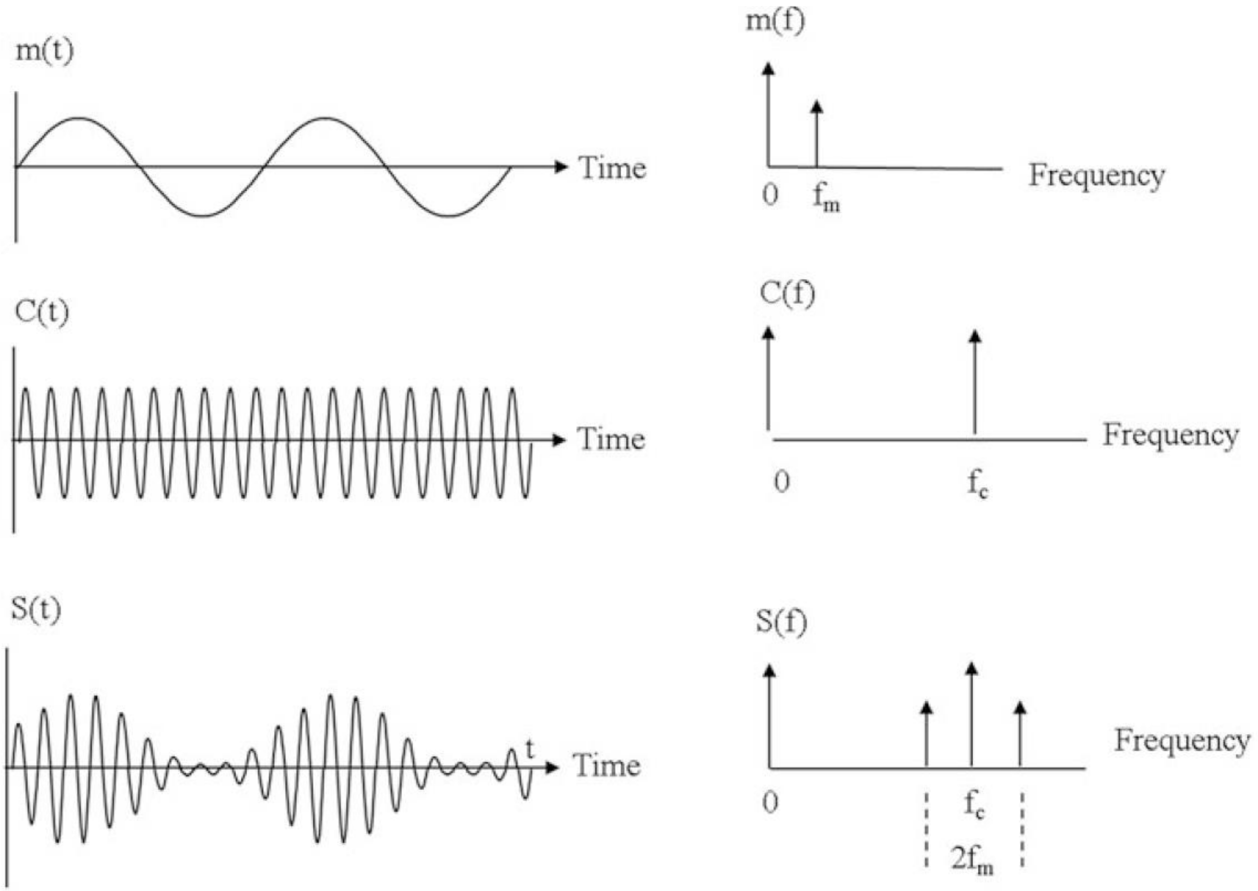
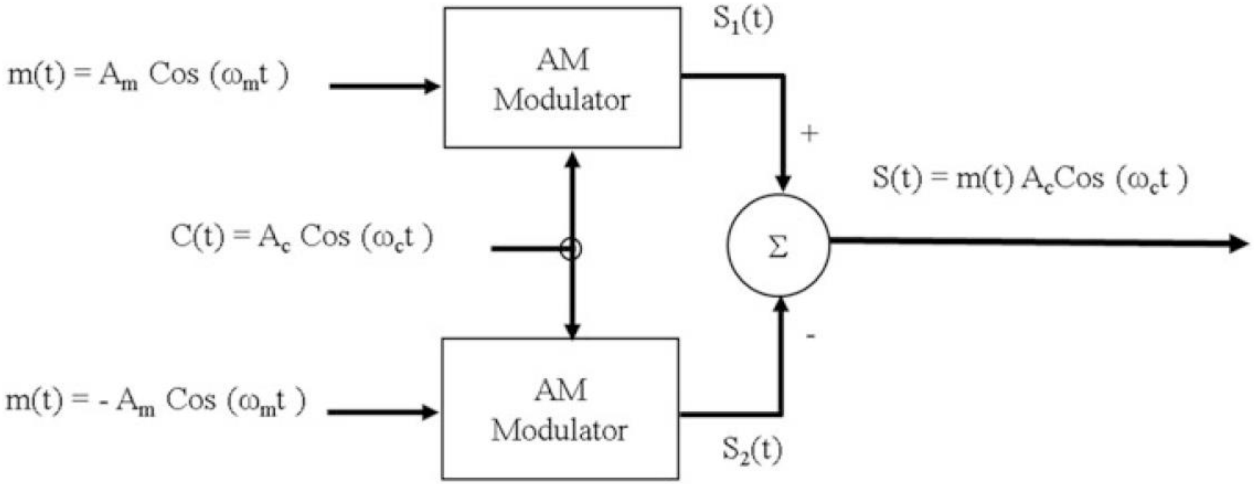
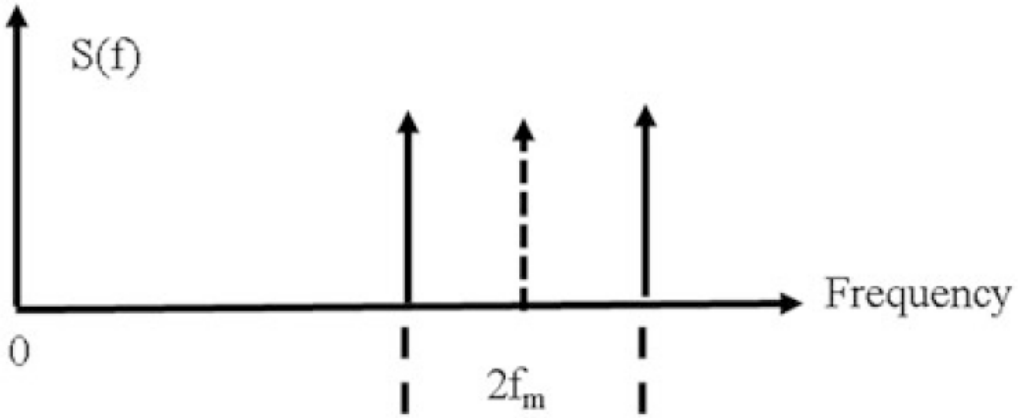


Modulação AM DSBSC





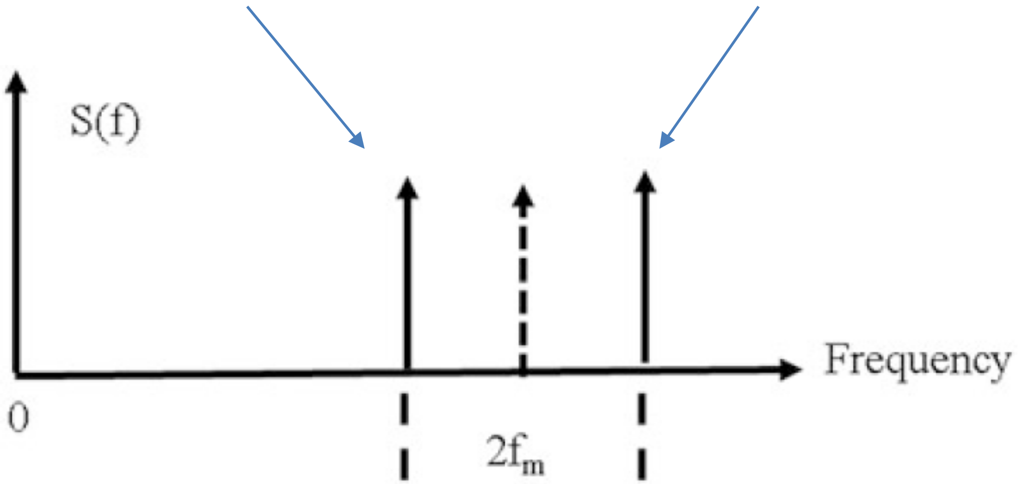
Modulação AM DSBSC

$$S(t) = \mathrm{M}\cos(2\pi f_m)\,.\,C\cos(2\pi \mathrm{f}_c)$$

$$S(t) = \mathrm{M}\sin(2\pi f_m + \phi)\,.\,C\sin(2\pi \mathrm{f}_c + \phi)$$

$$\sin(\mathrm{a})\cos(\mathrm{b}) = \frac{1}{2}(\sin(a+b) + \sin(a-b))$$

$$S(t) = \frac{MC}{2}\sin(2\pi(f_c - f_m)t - \phi) + \frac{MC}{2}\sin(2\pi(f_c + f_m)t + \phi)$$



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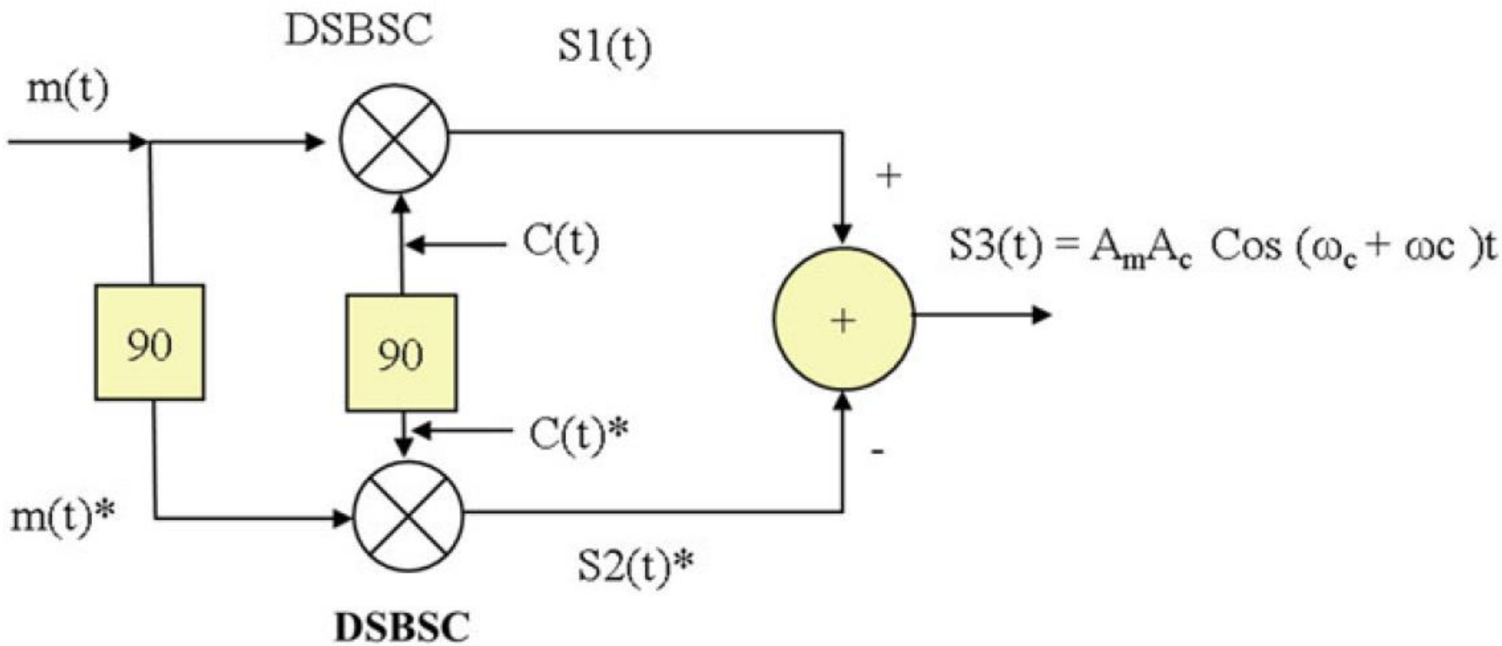
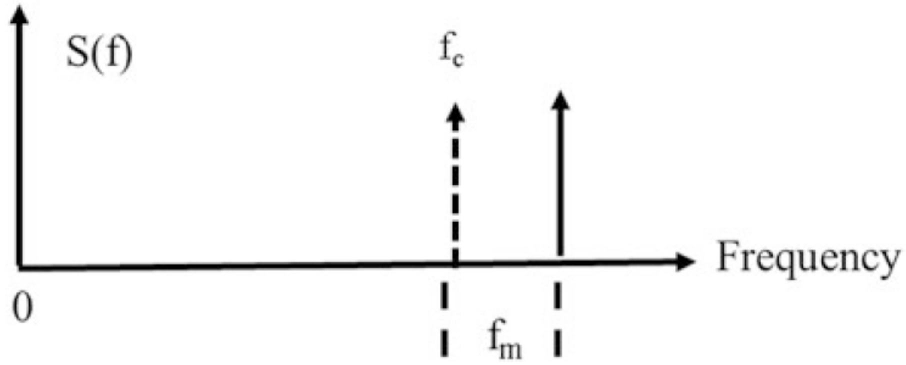
Modulação AM SSB





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Demodulação

$$S(t) = \frac{MC}{2}\sin(2\pi(f_c - f_m)t - \phi) + \frac{MC}{2}\ \sin(2\pi(f_c + f_m)t + \phi)$$

Multiplica-se o sinal pela portadora novamente

$$S(t) = [\frac{MC}{2}\sin(2\pi(f_c - f_m)t - \phi) + \frac{MC}{2}\sin(2\pi(f_c + f_m)t + \phi)]\ C\sin(2\pi f_c t)$$

Como

$$\sin(\mathrm{a})\cos(\mathrm{b}) = \frac{1}{2}(\sin(a+b) + \sin(a-b))$$

$$S'(t) = \frac{1}{4}[\cos(2\pi f_m t) - \underbrace{\cos(2\pi(2f_c + f_m)t)]}_{\text{Alta freq}} + \frac{1}{4}[\cos(-2\pi f_{mt}) - \underbrace{\cos(2\pi(-2f_c + f_m)t)]}_{\text{Alta freq}}$$

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