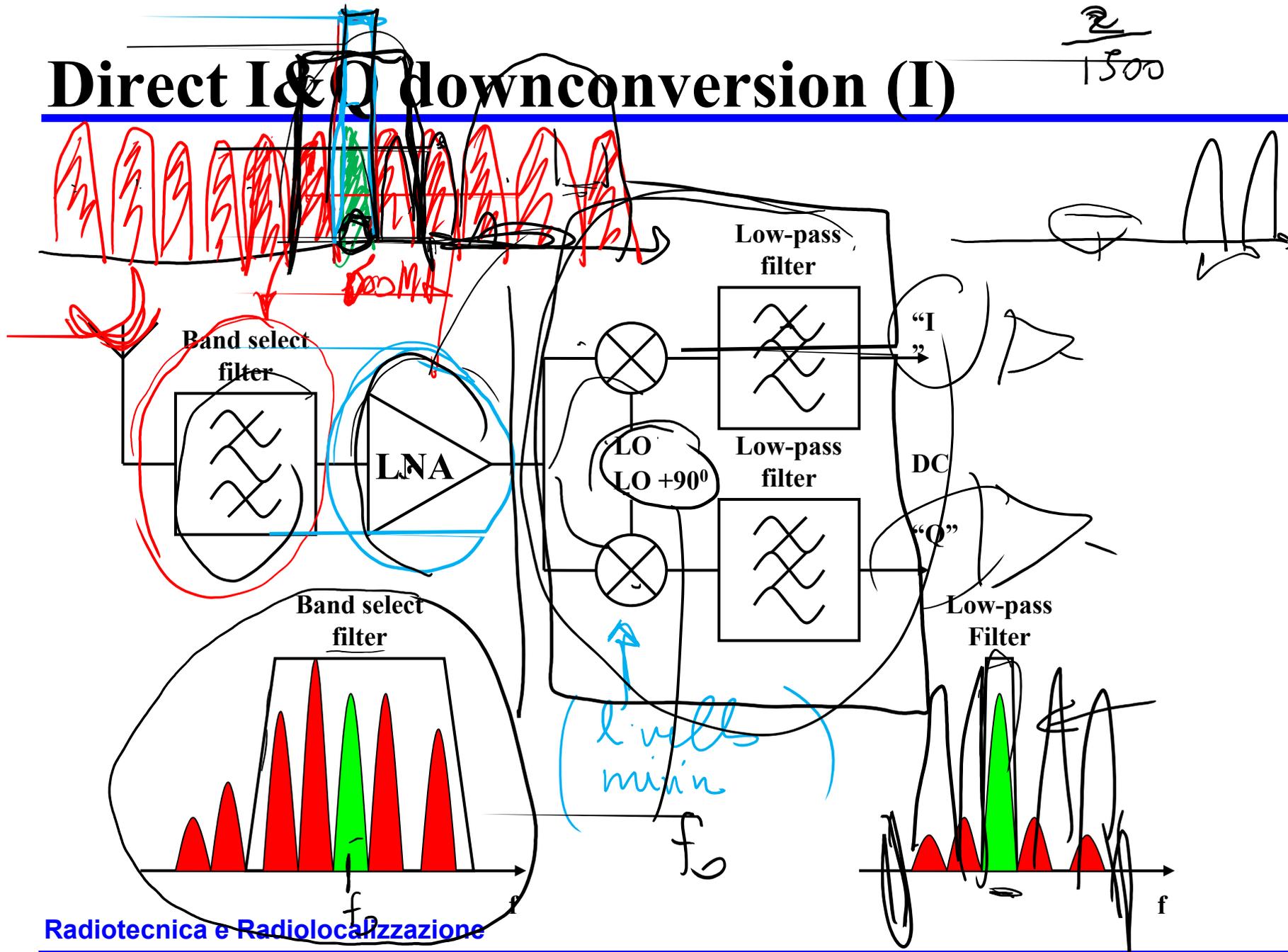
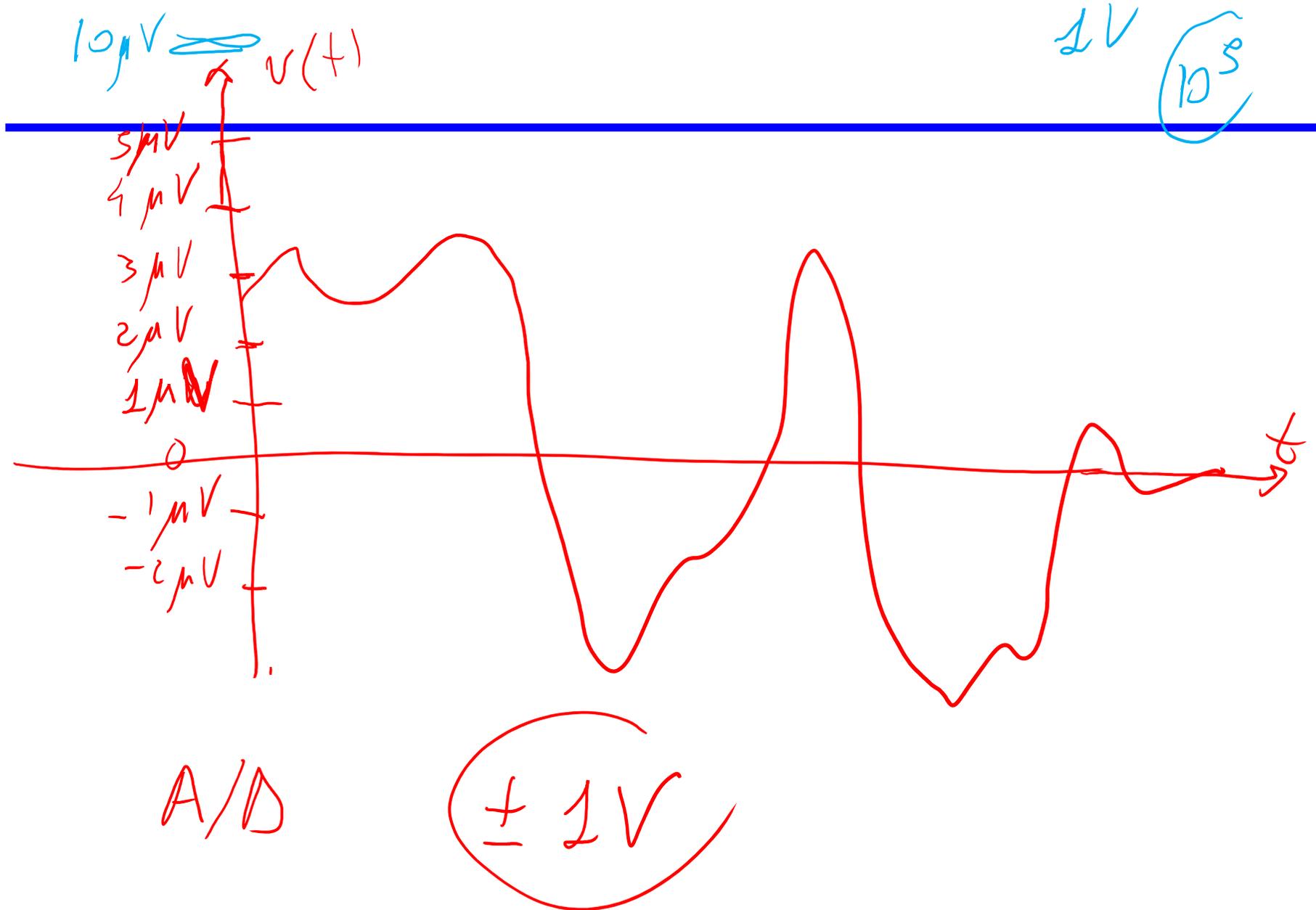

Schema del ricevitore: Piano delle frequenze, Filtri & Mixer

Pierfrancesco Lombardo

Direct I&Q downconversion (I)

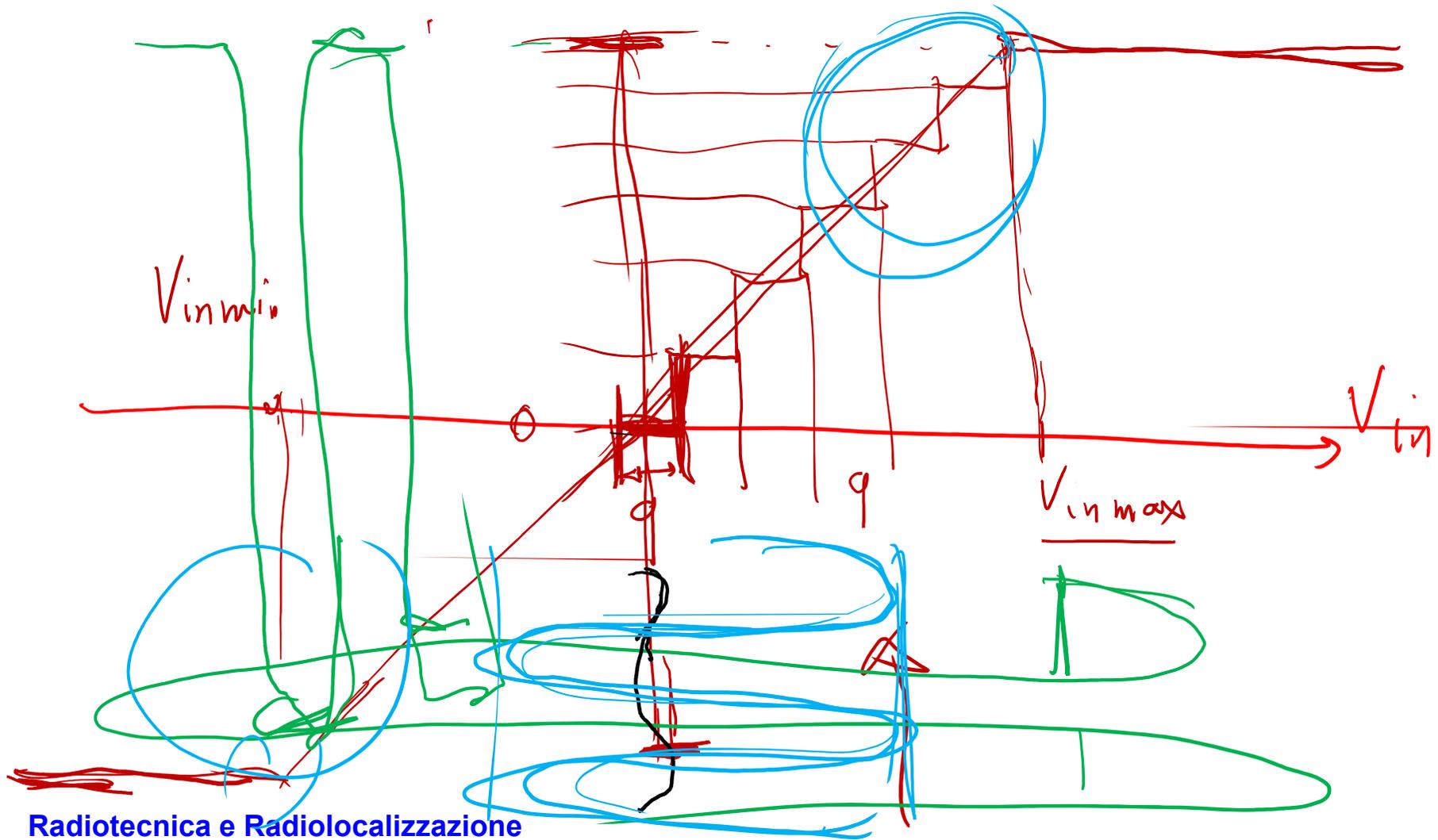
$\frac{2}{1500}$





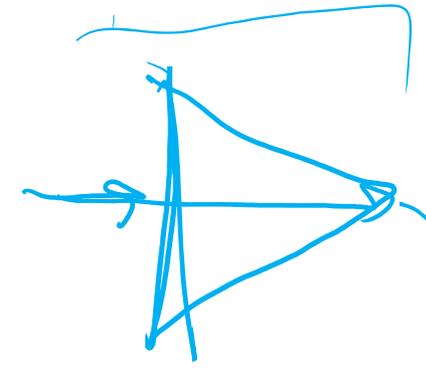
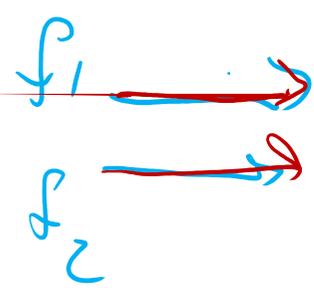
Dinamica di input $\pm V^t = D = 2V^t$

↳ Usaita



Dispositivo attivo

portazione non lineare



f_1 ampl.

f_2 ampl.

\emptyset $2f_1, 3f_1, 4f_1, 5f_1$
 $2f_2, 3f_2, 4f_2, 5f_2$

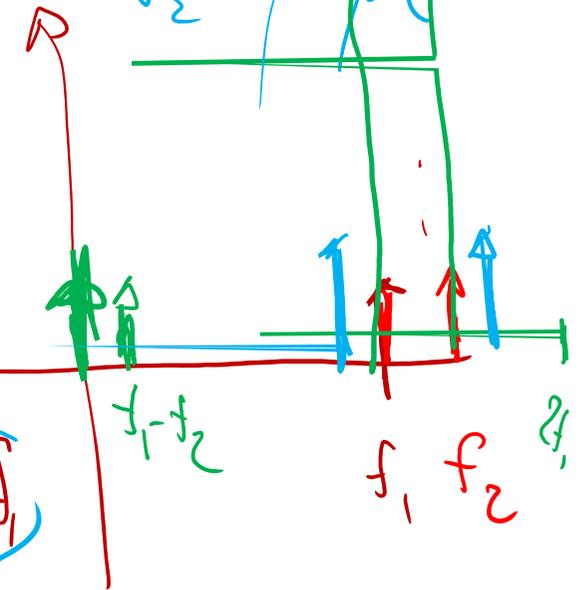
$f_1 + f_2$ $f_1 - f_2$

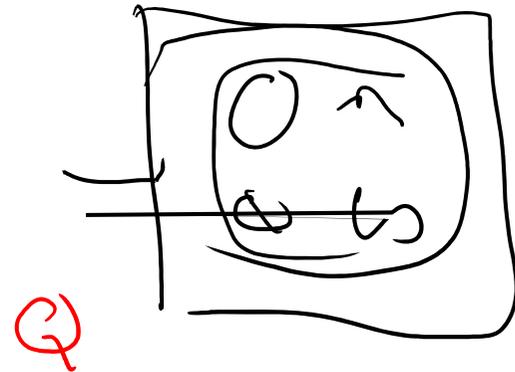
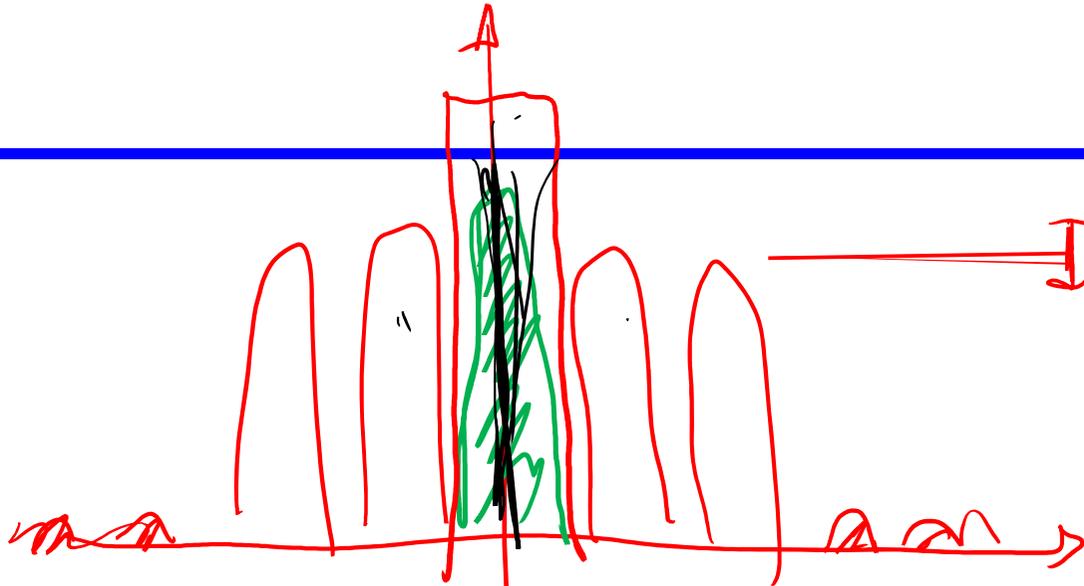
$2f_1 + f_2$

$2f_1 - f_2$

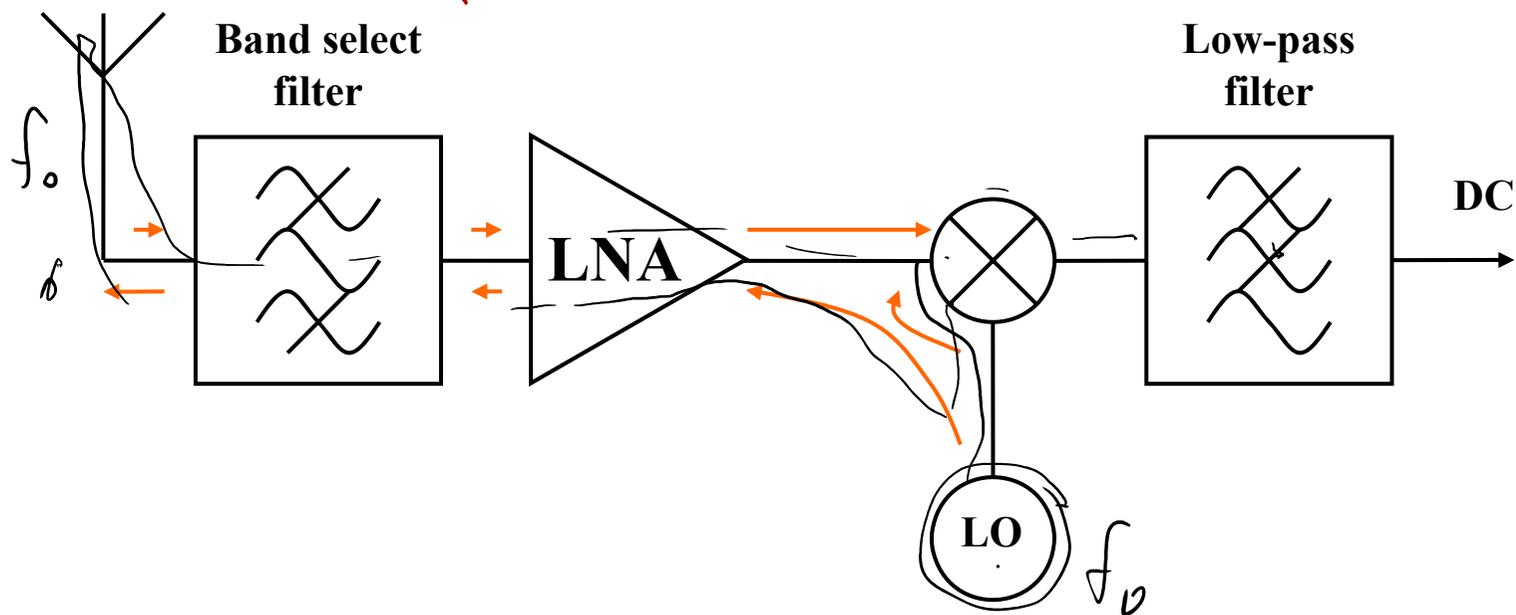
$f_2 + 2f_1$

$f_2 - 2f_1$





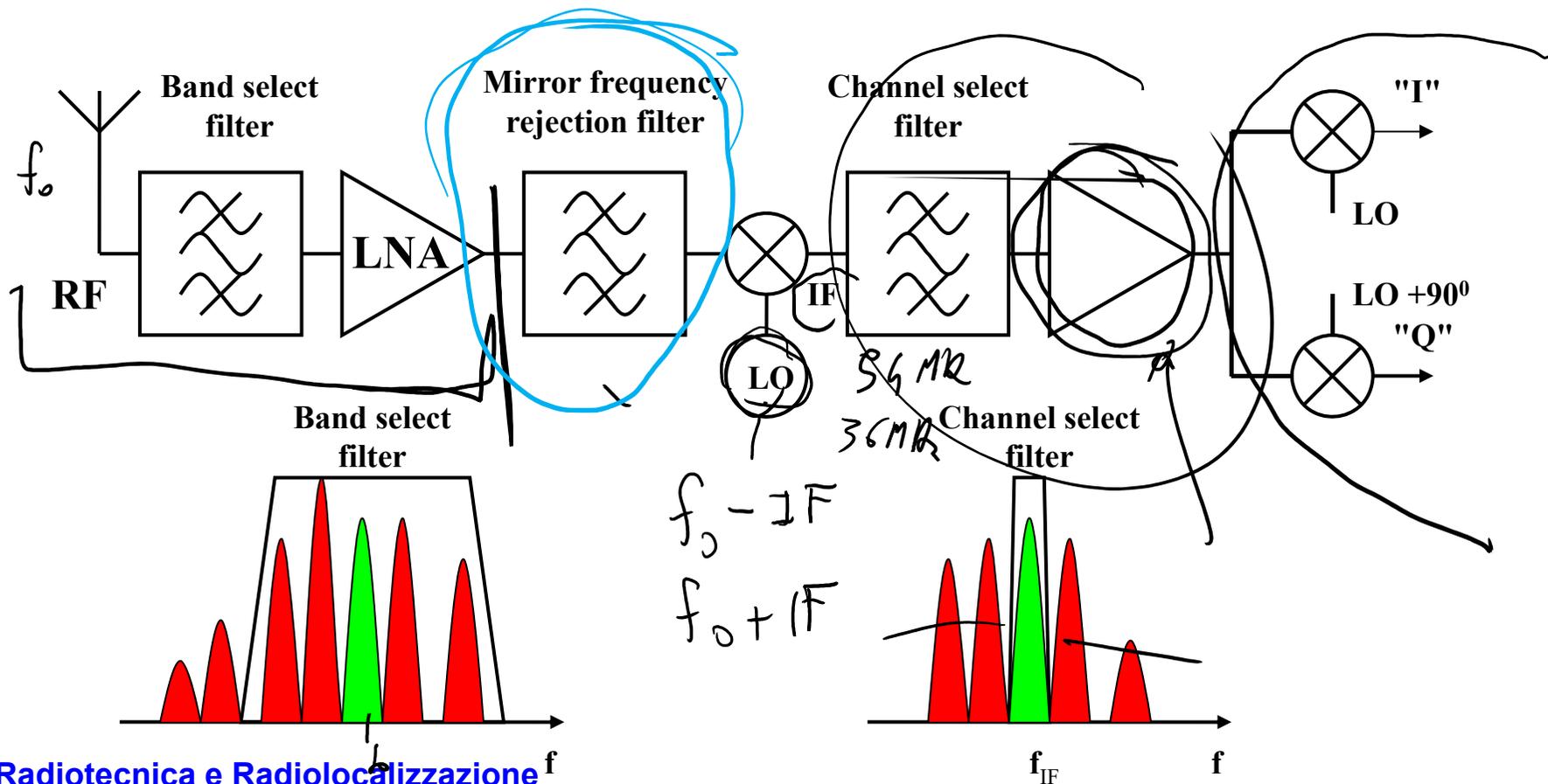
Direct I&Q downconversion (II)



Schema di ricevitore eterodina

Due stadi di conversione:

- 2° stadio ad IF : *amplificazione e filtraggio a frequenza costante*
- 1° stadio a RF : *capacità di selezionare una frequenza da una banda più ampia*

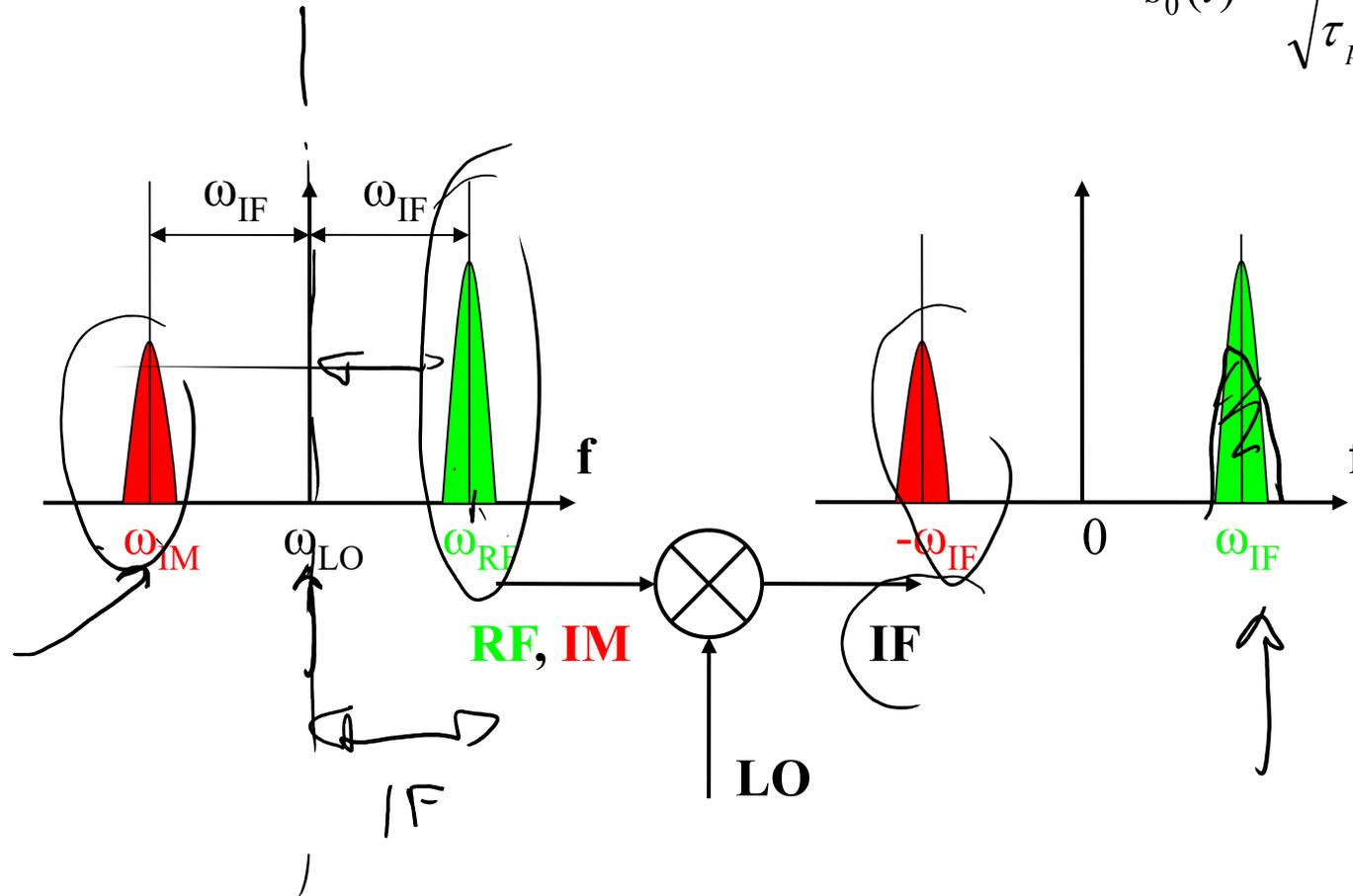


Radiotecnica e Radiolocalizzazione

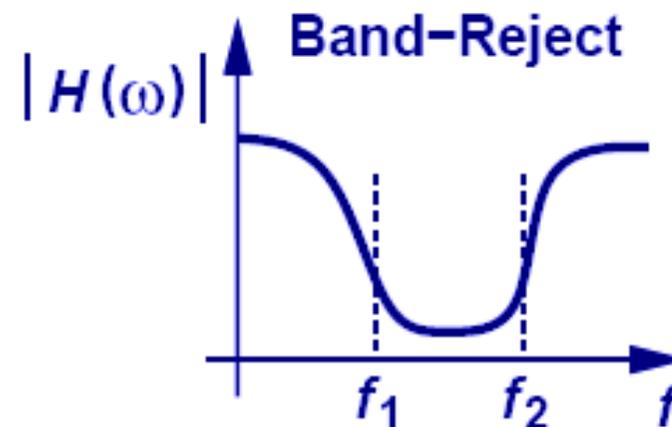
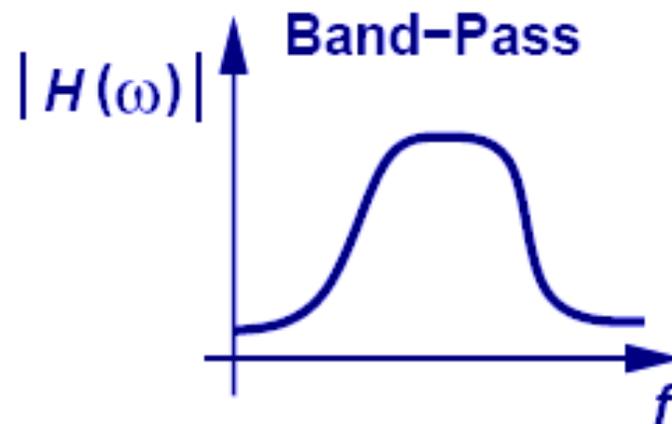
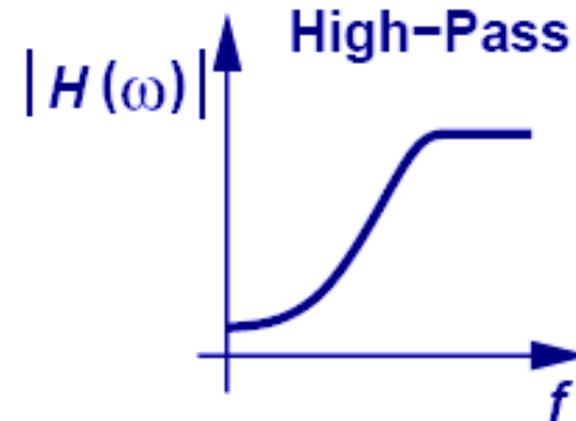
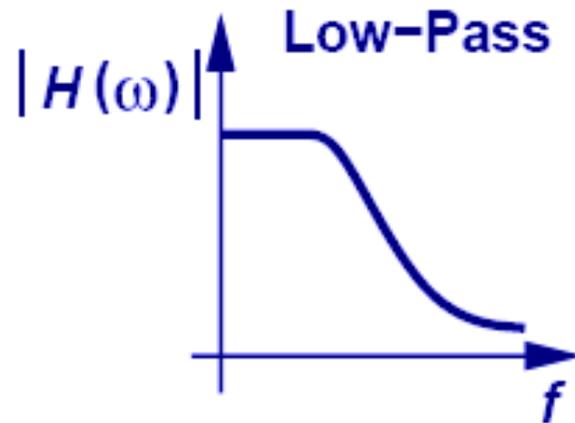
Frequenza immagine e sua reiezione

Funzione di Ambiguità: Chirp con involuppo rettangolare

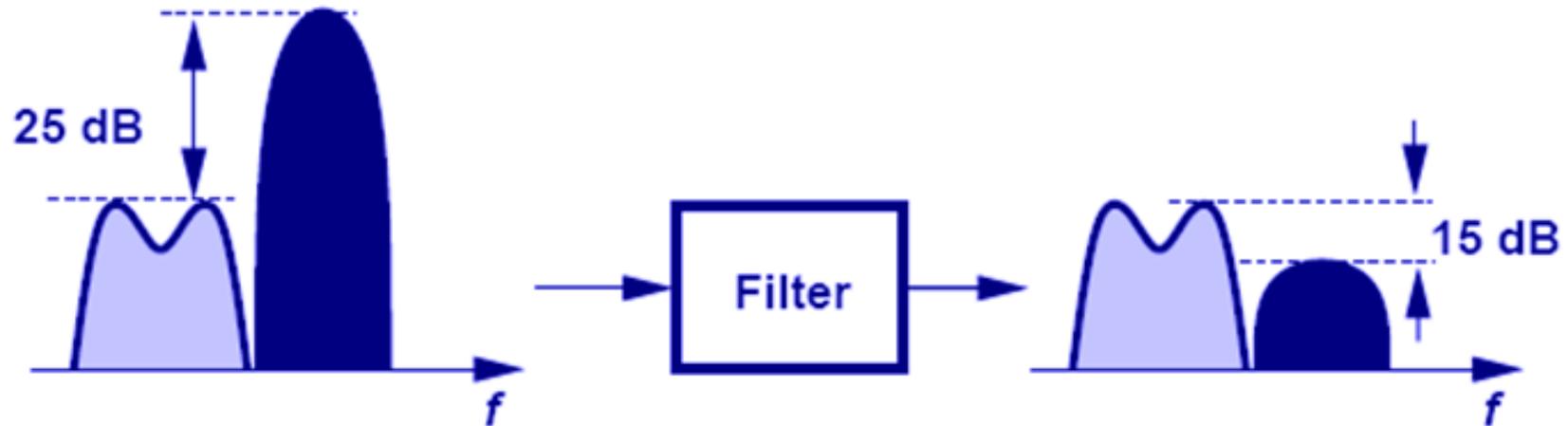
$$s_0(t) = \frac{1}{\sqrt{\tau_p}} \text{rect}_{\tau_p}(t) e^{j\pi k t^2}$$



Tipologie di filtro



Example: Filter I

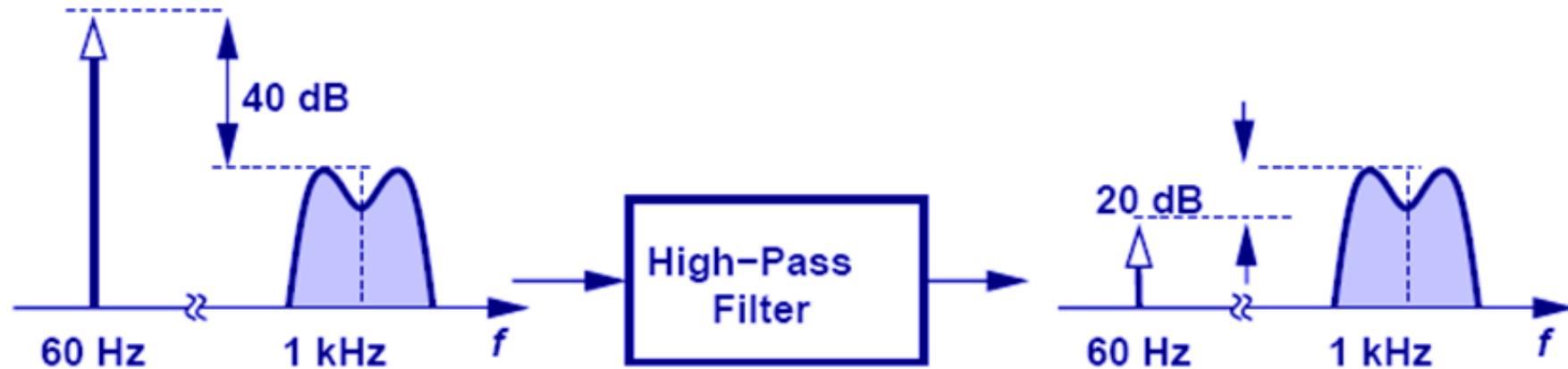


Given: Adjacent channel Interference is 25 dB above the signal

Design goal: Signal to Interference ratio of 15 dB

Solution: A filter with stop band of 40 dB

Example: Filter II

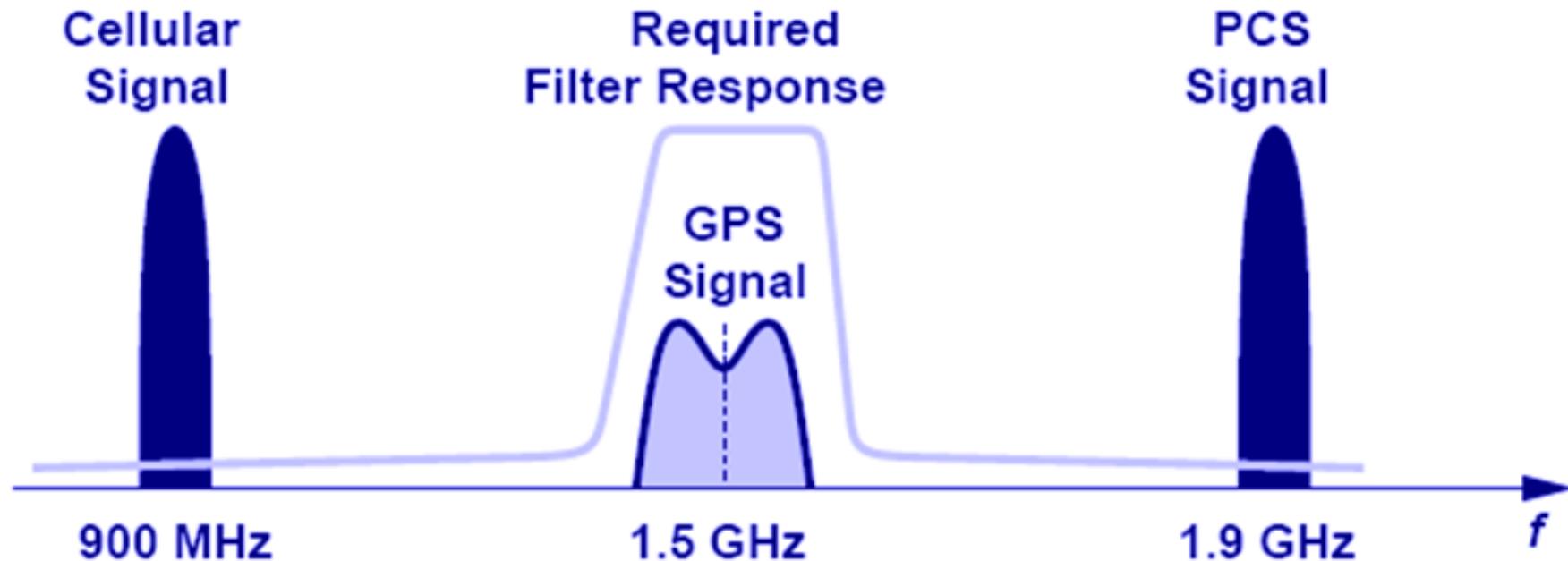


Given: Adjacent channel Interference is 40 dB above the signal

Design goal: Signal to Interference ratio of 20 dB

Solution: A filter with stop band of 60 dB at 60 Hz

Example: Filter III



- A bandpass filter around 1.5 GHz is needed to reject the adjacent Cellular and PCS signals.

Filtro Passabanda ad RF

Considerando banda frazionale stretta di 0,5%

$$1 \text{ GHz} \quad BW = 5 \text{ MHz}$$

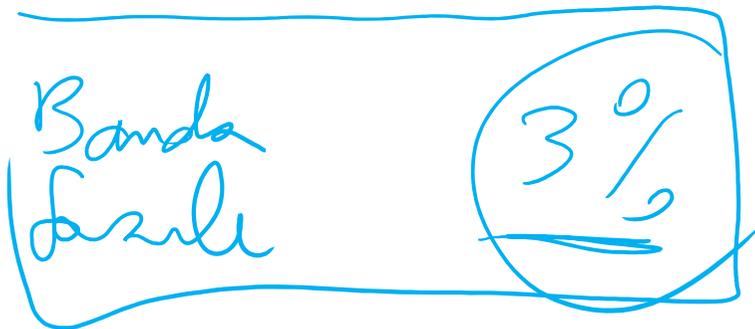
$$3 \text{ GHz} \quad BW = 15 \text{ MHz}$$

$$6 \text{ GHz} \quad BW = 30 \text{ MHz}$$

$$10 \text{ GHz} \quad BW = 50 \text{ MHz}$$

Con risoluzione di 60 m

$$B = \frac{c}{2 \cdot 60} = \frac{3 \cdot 10^8}{2 \cdot 60} = 2,5 \cdot 10^6 = 2,5 \text{ MHz}$$



$$f_0 = 600 \text{ MHz} \rightarrow \underline{18 \text{ MHz}}$$

$$\underline{50 \text{ MHz}}$$

Mixer e spurie

Funzione di Ambiguit

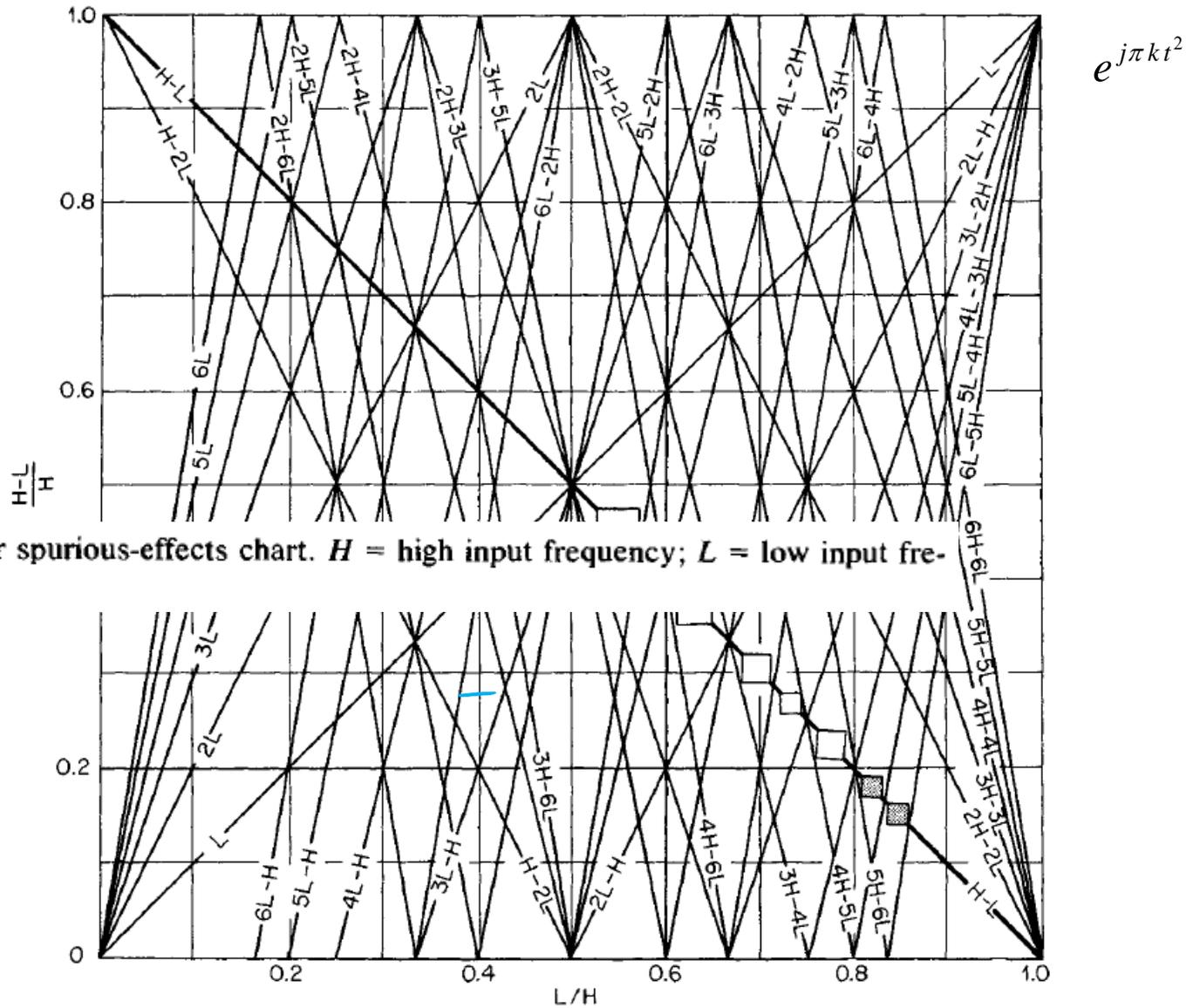


FIG. 3.2 Downconverter spurious-effects chart. H = high input frequency; L = low input frequency.

Piani di frequenza

