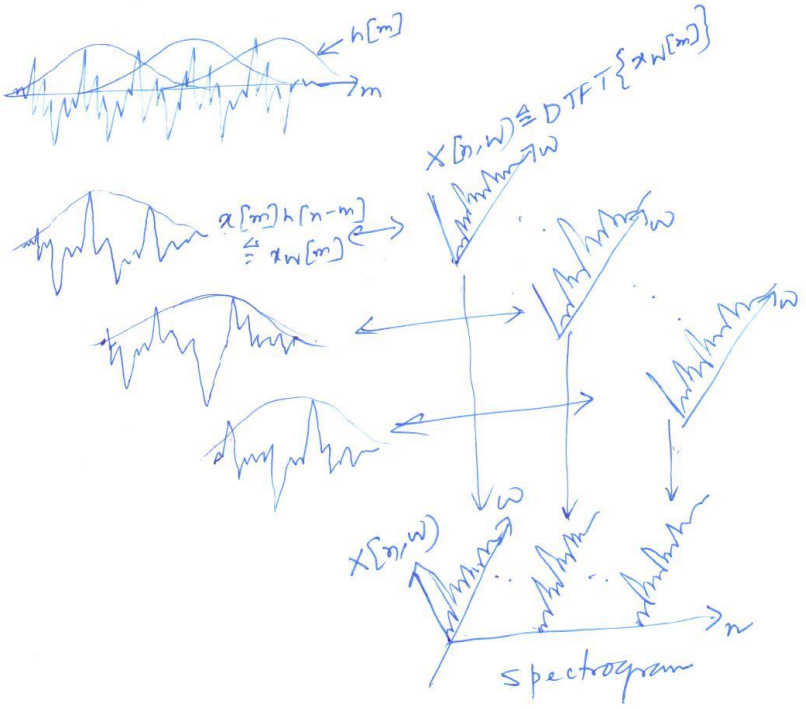
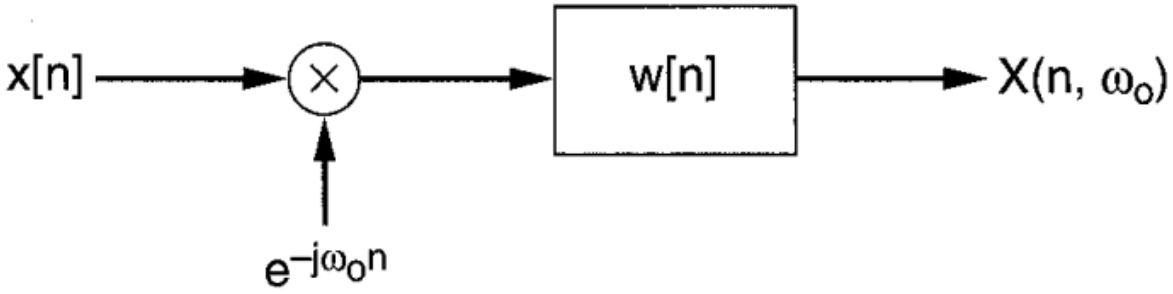
STFT



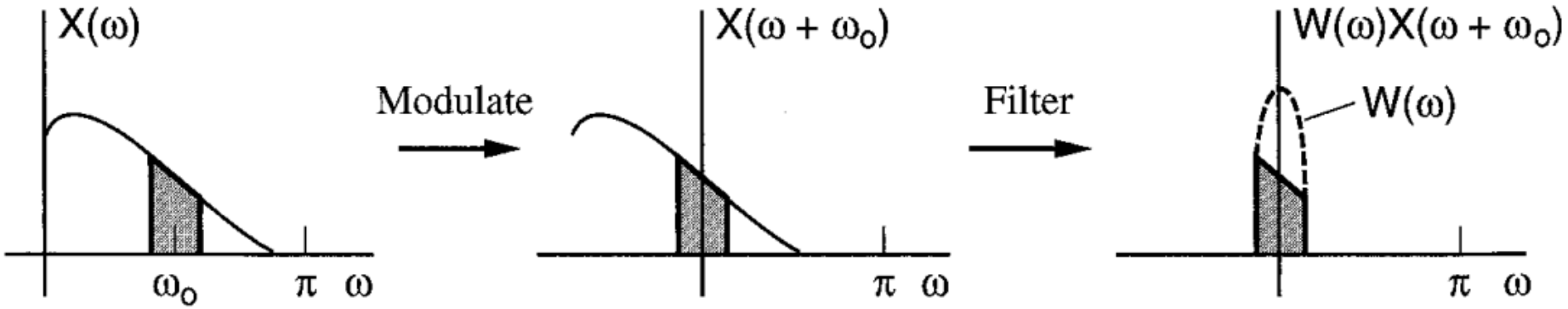
$$X[n,\omega] = \sum_{m=-\infty}^{\infty} x[m]\, h[n-m]\, e^{-j\omega m}$$

$$x[n] = \frac{1}{2\pi h[0]} \int_{-\pi}^{\pi} X[n,\omega]\, e^{j\omega n}\, d\omega$$

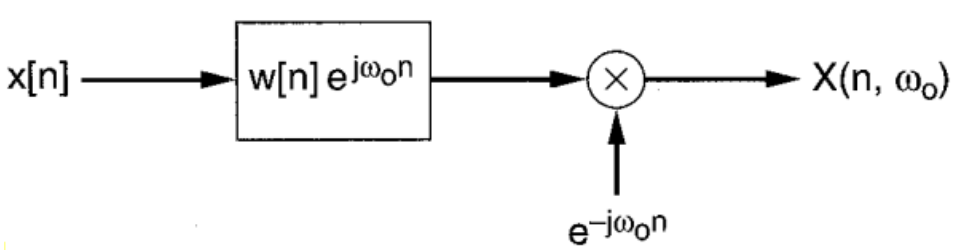
$$X[n,\omega) = \frac{1}{2\pi} \int_{-\pi}^{\pi} H(\theta)\, e^{j\theta n}\, X(\omega+\theta)\, d\theta.$$



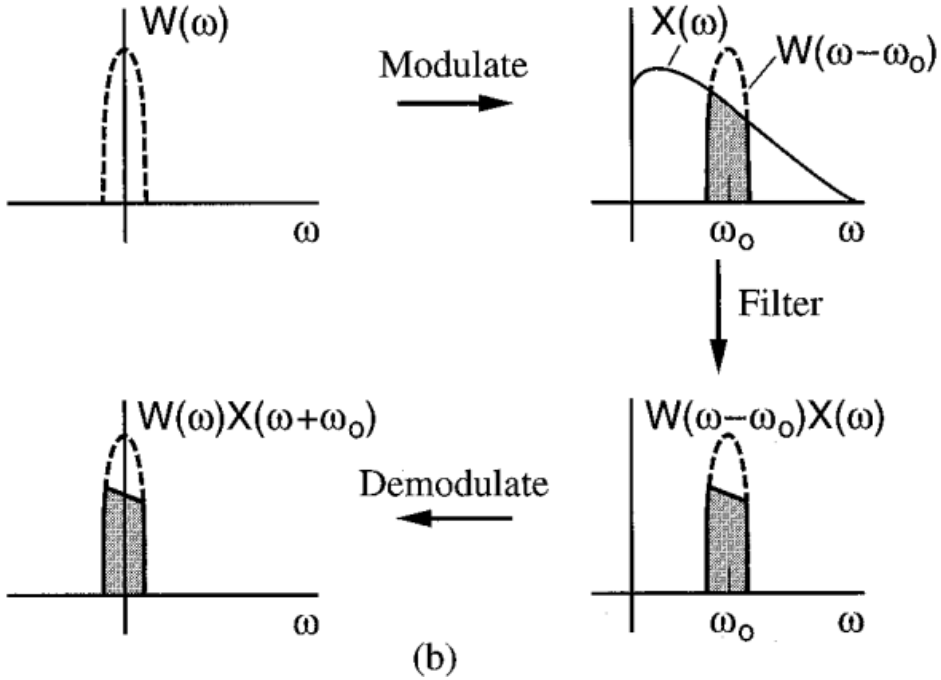
(a)



(b)


x[n]
w[n] e^{jω_o n}
X(n, ω_o)
e^{−jω_o n}

(a)


W(ω)
ω
Modulate
X(ω)
W(ω−ω_o)
ω_o
ω
Filter
W(ω−ω_o)X(ω)
ω_o
ω
Demodulate
W(ω)X(ω+ω_o)
ω

(b)

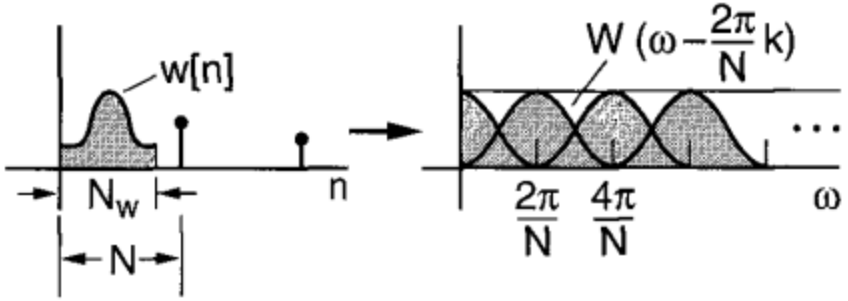
FBS Method

$$y[n] = \left[\frac{1}{Nw[0]}\right] \underbrace{\sum_{k=0}^{N-1} X(n, k)\, e^{j\frac{2\pi}{N}kn}}$$

Adding Frequency Components For Each n

FBS Constraint: $\sum_{k=0}^{N-1} W(\omega - \frac{2\pi}{N}k) = Nw[0]$

For $N_w < N \rightarrow y[n] = x[n]$



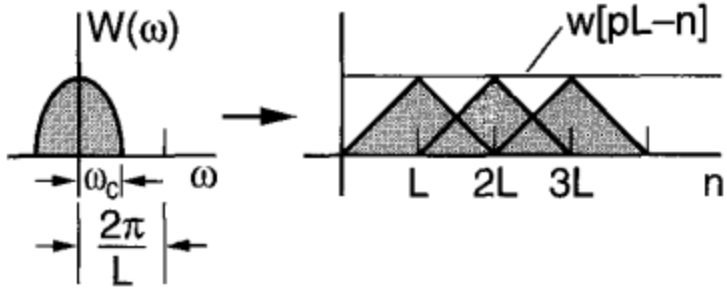
OLA Method

$$y[n] = \left[\frac{L}{W(0)}\right] \underbrace{\sum_{p=-\infty}^{\infty} x[n]\, w[pL-n]}$$

Adding Time Components For Each n

OLA Constraint: $\sum_{p=-\infty}^{\infty} w[pL-n] = \frac{W(0)}{L}$

For $\omega_c < \frac{2\pi}{L} \rightarrow y[n] = x[n]$



$$X[n, \omega_r] = \sum_{m=-\infty}^{\infty} x[m]\, h[n-m]\, e^{-j\omega_r m}$$

$$\rightarrow = DTFT_m \left\{ x[m]\, h[n-m] \right\}$$

$$\rightarrow = \left\{ x[n]\, e^{-j\omega_r n} \right\} * h[n]$$

$$= e^{-j\omega_r n} \left\{ x[m] * h[m] \right\}$$

$$\rightarrow = e^{-j\omega_r n} \left\{ x[n] * h[m]\, e^{j\omega_r n} \right\}$$

$$x[n] = \frac{1}{2\pi\, h[0]} \int_{-\pi}^{\pi} X[n, \omega)\, e^{j\omega n}\, d\omega$$