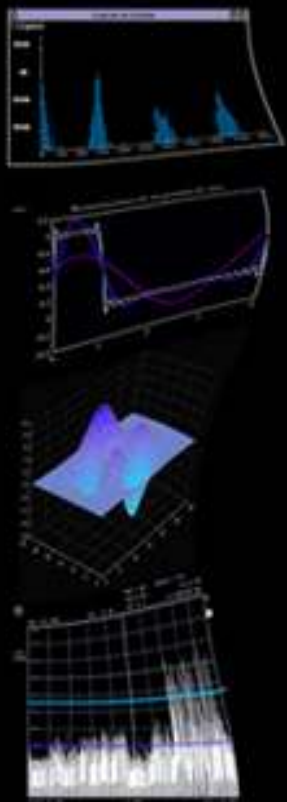
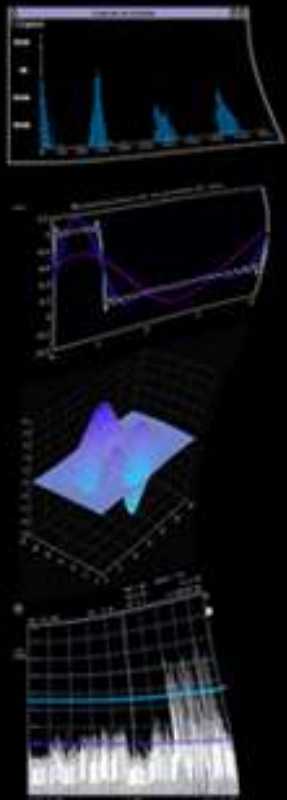


# Transformada Discreta de Fourier



# Transformada Discreta de Fourier

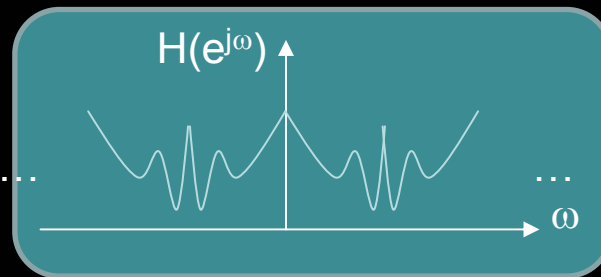
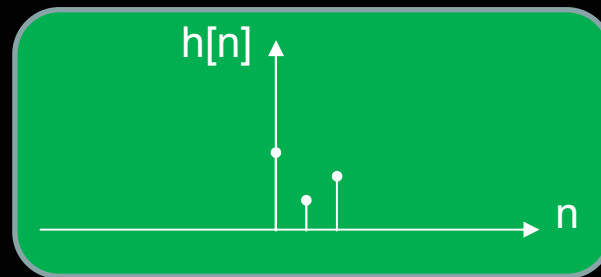
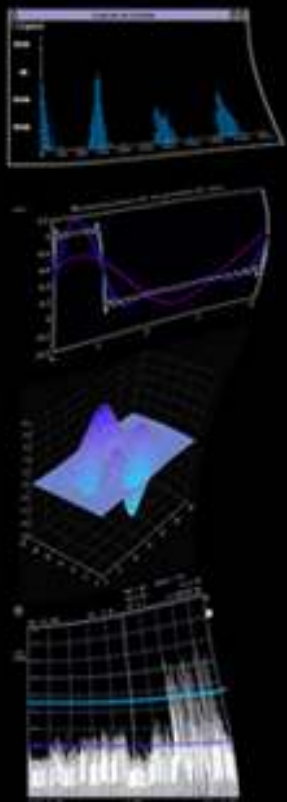
## Transformada Discreta de Fourier



|                          |   |
|--------------------------|---|
| <b>Transformada</b>      | $TDF\{x[n]\} = X[k] = \sum_{n=0}^{L-1} x[n] e^{-j\frac{2\pi kn}{L}}$ $k = 0; 1; \dots; L-1$                 |
| <b>Antittransformada</b> | $TDF^{-1}\{X[k]\} = x[n] = \frac{1}{L} \sum_{k=0}^{L-1} X[k] e^{j\frac{2\pi kn}{L}}$ $n = 0; 1; \dots; L-1$ |

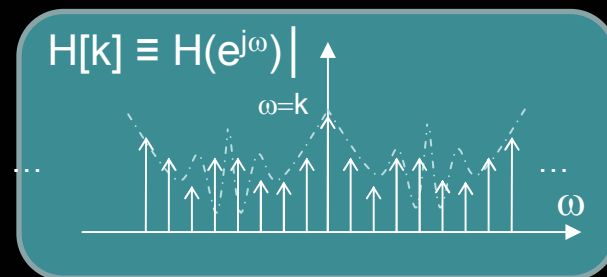
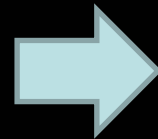
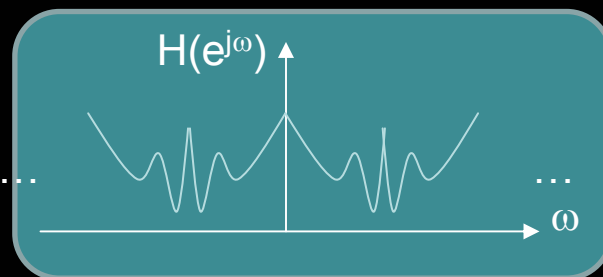
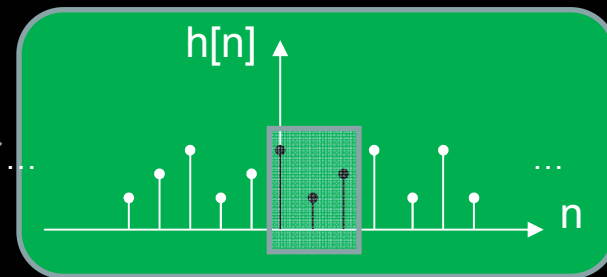
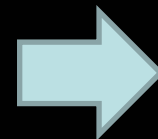
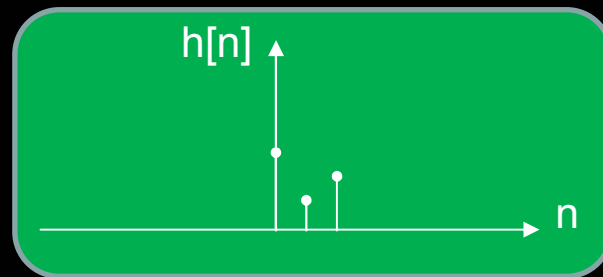
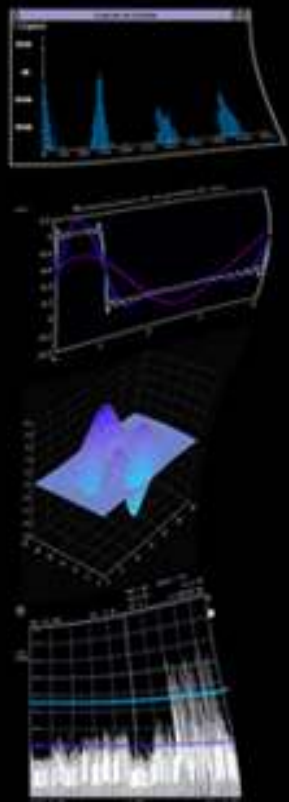
# Transformada Discreta de Fourier

Replicar periódicamente



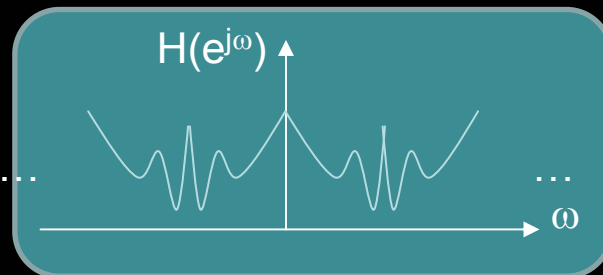
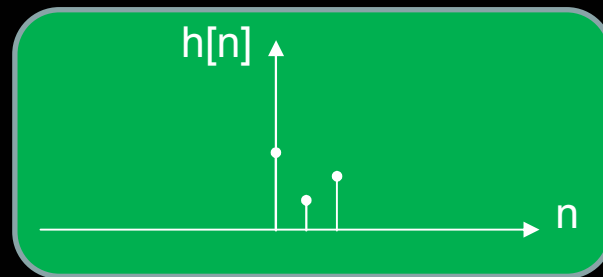
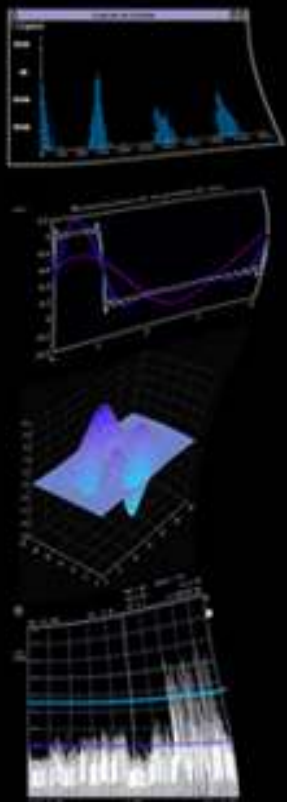
# Transformada Discreta de Fourier

Replicar periódicamente



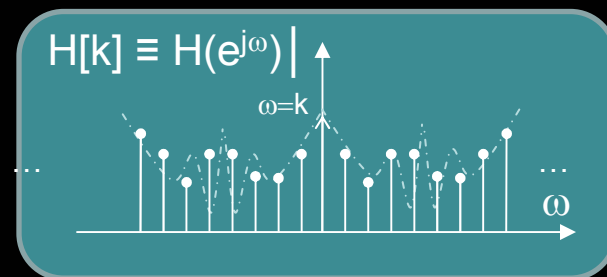
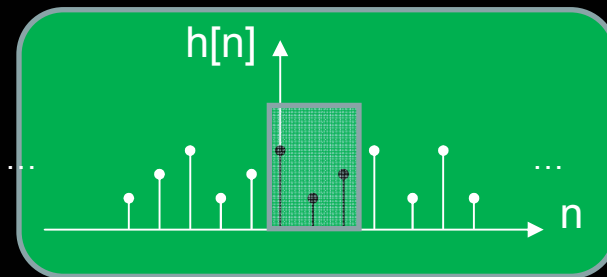
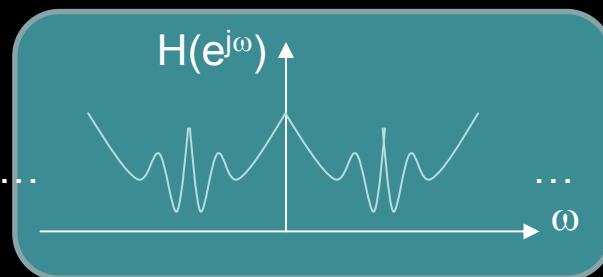
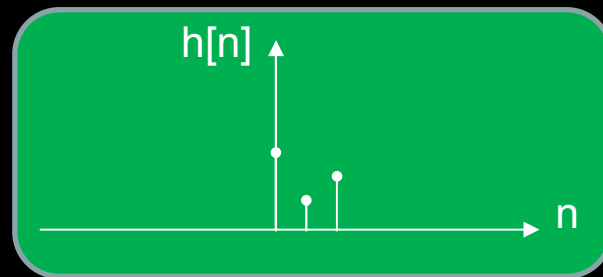
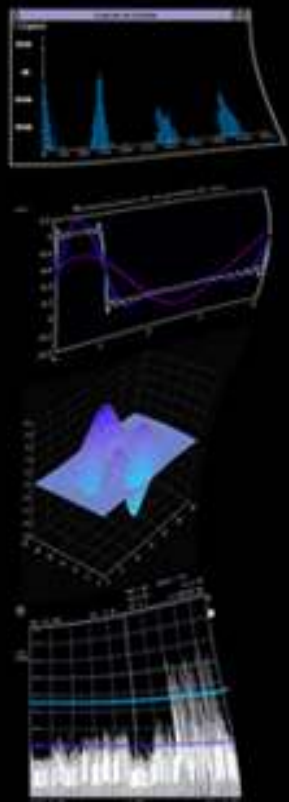
# Transformada Discreta de Fourier

Muestrear el espectro



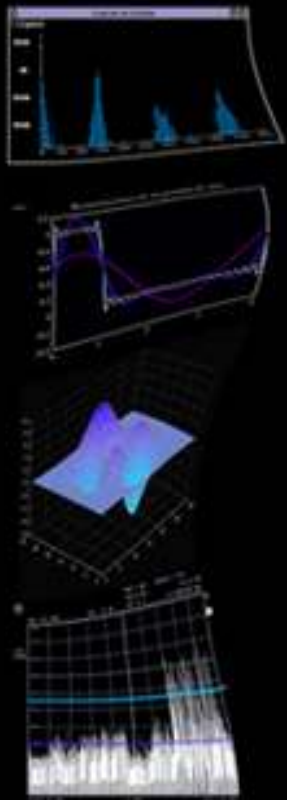
# Transformada Discreta de Fourier

Muestrear el espectro



# Transformada Discreta de Fourier

## Propiedades



### Periodicidad

$$x[n] \stackrel{TDF}{\leftrightarrow} X[k] \Rightarrow X[k] = X[k + mL] \quad m \in \mathbb{Z}$$

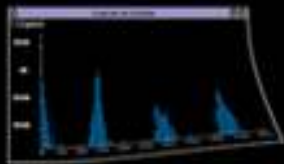
### Simetría

$$x[n] = x_{\Re}^e[n] + x_{\Re}^o[n] + jx_{\Im}^e[n] + jx_{\Im}^o[n]$$

$$X[k] = X_{\Re}^e[k] + X_{\Re}^o[k] + jX_{\Im}^e[k] + jX_{\Im}^o[k]$$

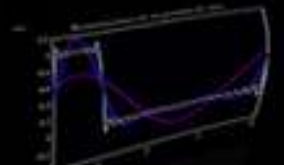
# Transformada Discreta de Fourier

## Propiedades



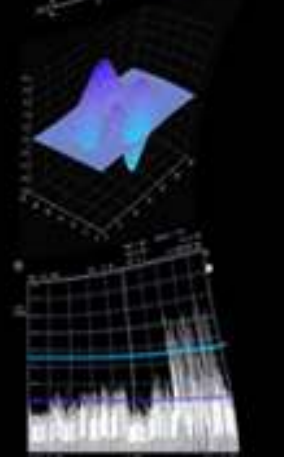
### Linealidad

$$c_1x_1[n] + c_2x_2[n] \stackrel{TDF}{\leftrightarrow} c_1X_1[k] + c_2X_2[k]$$



### Reflexión circular

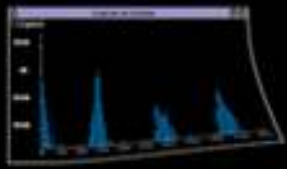
$$x\langle[-n]\rangle_L \stackrel{TDF}{\leftrightarrow} X\langle[-k]\rangle_L$$





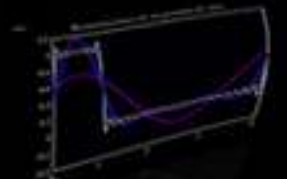
# Transformada Discreta de Fourier

## Propiedades



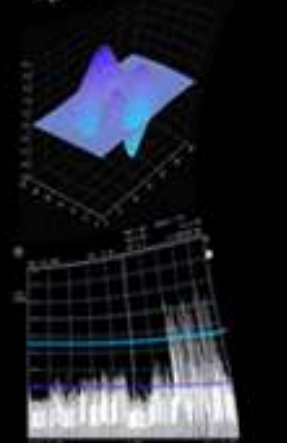
### Desplazamiento Circular Temporal

$$x\langle [n \sim l] \rangle_L \stackrel{TDF}{\leftrightarrow} X[k] e^{-j\frac{2\pi k l}{L}}$$



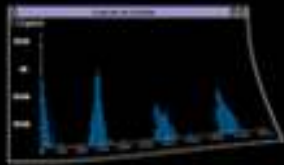
### Desplazamiento Circular Espectral

$$x[n] e^{j\frac{2\pi l n}{L}} \stackrel{TDF}{\leftrightarrow} X\langle [k \sim l] \rangle_L$$



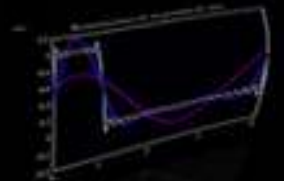
# Transformada Discreta de Fourier

## Propiedades



### Modulación

$$x_1[n]x_2[n] \stackrel{TDF}{\leftrightarrow} \frac{1}{L} X_1[k] \otimes X_2[k]$$



### Conjugación

$$x^*[n] \stackrel{TDF}{\leftrightarrow} X^*[L-k]$$

