Entre Rayos, Señales y Ruido

Miguel Becerra

Juan Andrés Guarín Rojas

Facultad de Ciencias, Escuela de Física

24 de junio de 2022

Universidad Industrial de Santander

#LaUISqueQueremos

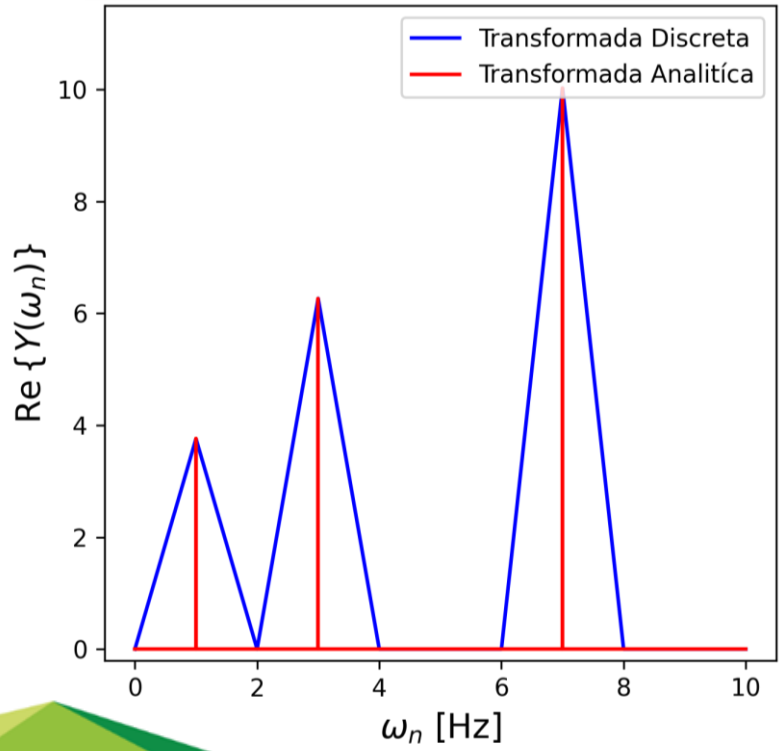
72 años Universidad Industrial de Santander Patrimonio educativo y cultural

Parte Real e Imaginaria de la Transformada de Fourier

$$\mathcal{F}\{y(t)\} = \int_{-\infty}^{\infty} dt\, \frac{e^{-ist}}{\sqrt{2\pi}} y(t)$$

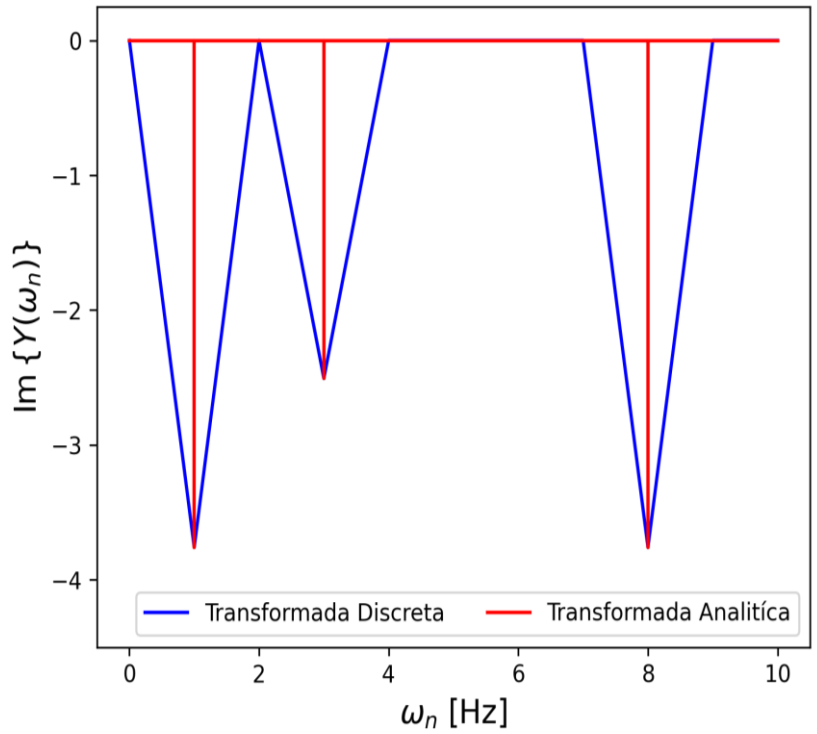
Señal de Cosenos

$$\mathcal{F}\{3\cos(\omega t) + 5\cos(3\omega t) + 8\cos(7\omega t)\} = \frac{\sqrt{2\pi}}{2}[3\delta(s-1) + 3\delta(s+1) + 5\delta(s-3) + 5\delta(s+3) + 8\delta(s-7) + 8\delta(s+7)]$$



Señal de Senos

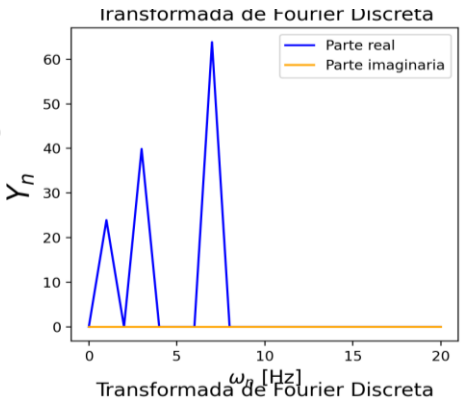
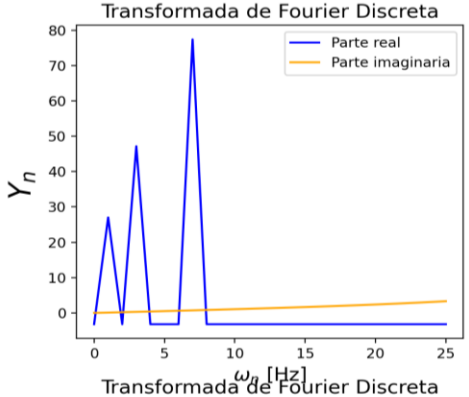
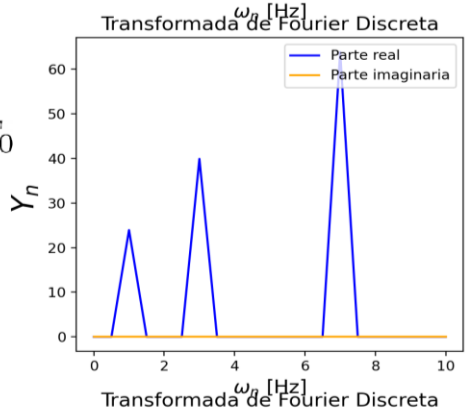
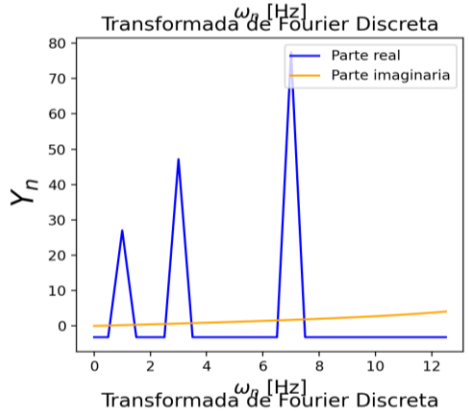
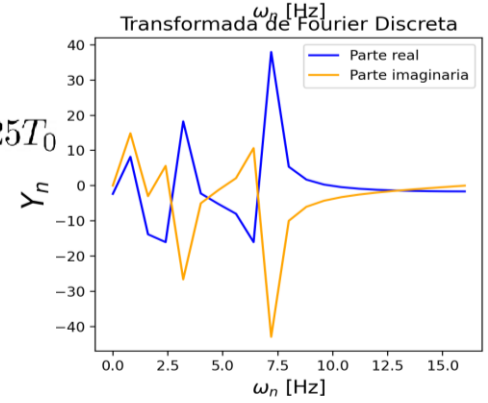
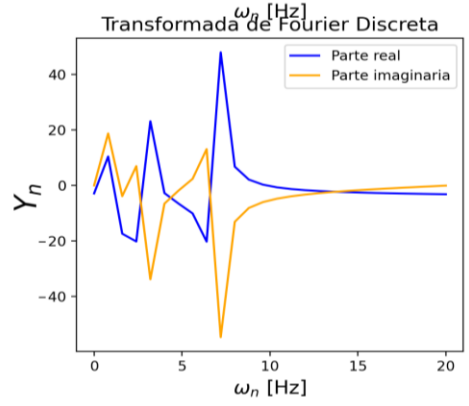
$$\mathcal{F}\{3\sin(\omega t) + 2\sin(3\omega t) + 3\sin(8\omega t)\} = \frac{\sqrt{2\pi}i}{2}[-3\delta(s-1) + 3\delta(s+1) - 2\delta(s-3) + 2\delta(s+3) - 3\delta(s-8) + 3\delta(s+8)]$$



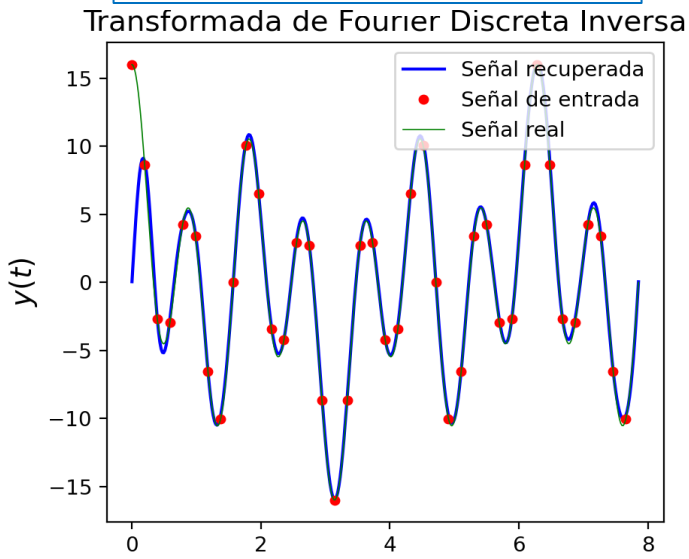
$$\mathcal{F}^{-1}\{\sqrt{2\pi}a\,\delta(s-b)\} = \int_{-\infty}^{\infty} ds\, \frac{e^{ist}}{\sqrt{2\pi}}\, a\sqrt{2\pi}\delta(s-b) = a\int_{-\infty}^{\infty} ds\, e^{ist}\delta(s-b) = a\, e^{ist}|_{s=b} = a\, e^{ibt}$$

Variación de parámetros Transformada Discreta

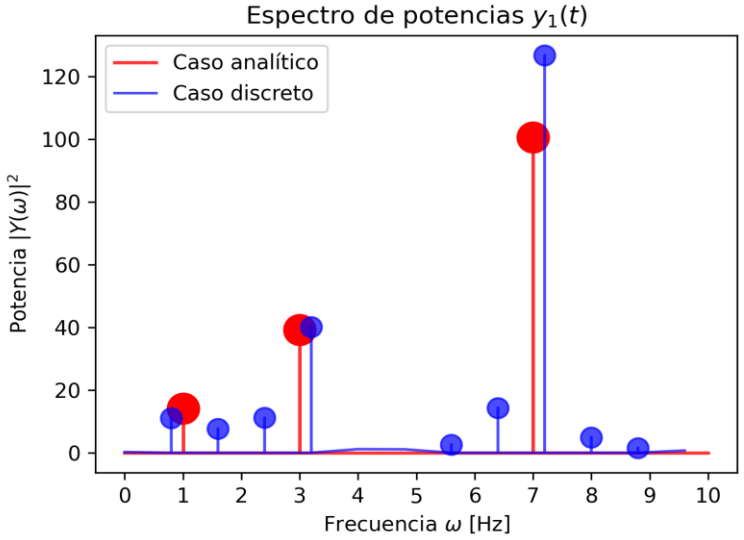
$$y_1(t) = 3\cos(\omega t) + 5\cos(3\omega t) + 8\cos(7\omega t)$$

	$N = 40$	$N = 50.5$
$T = T_0$		
$T = 2T_0$		
$T = 1.25T_0$		

$$T = 1.25T_0 \qquad N = 40$$

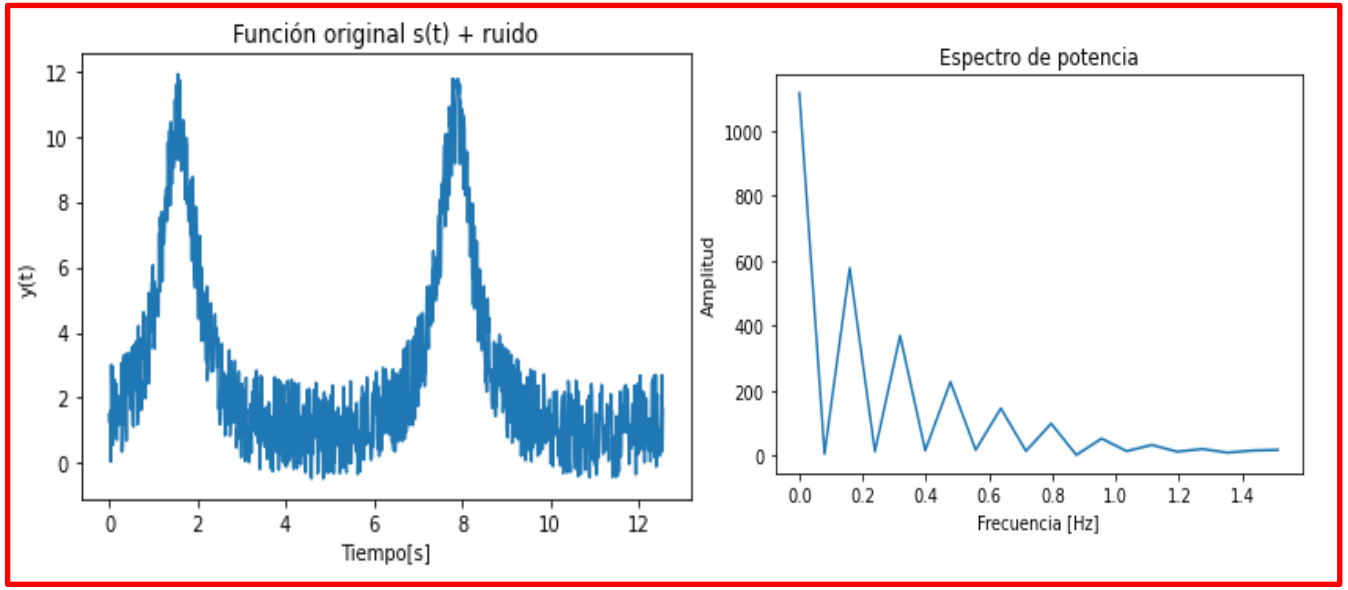


$$\text{espectro}(s) = |Y(s)|^2$$



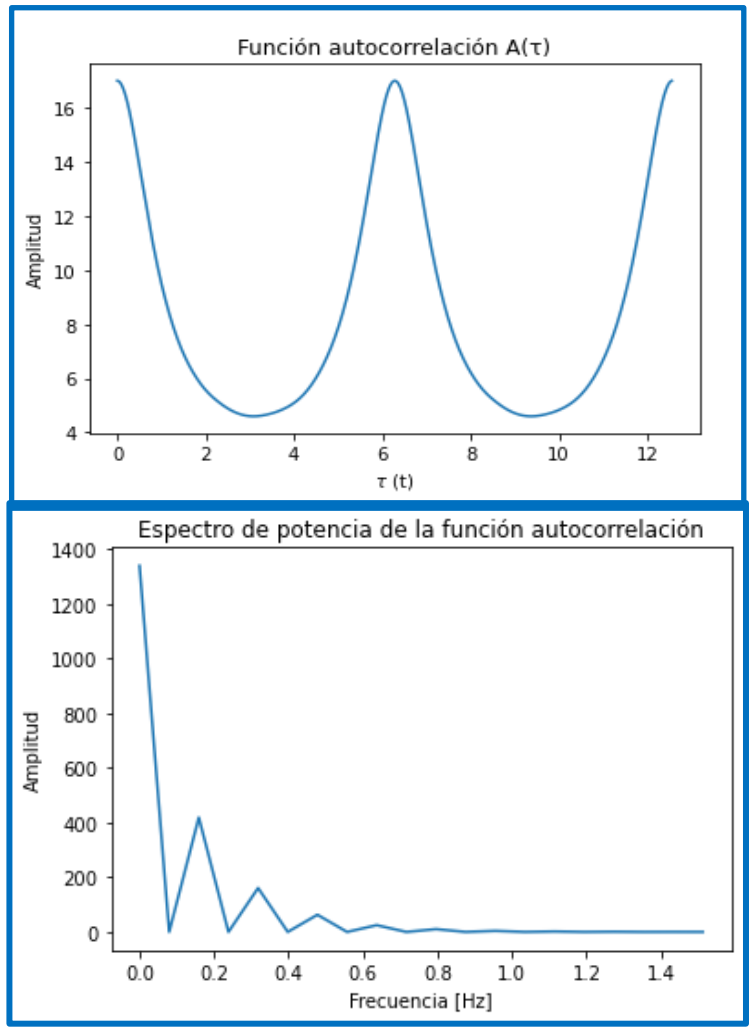
Autocorrelación señal ruidosa

$$y(t_i) = \frac{10}{10 - 9\sin(t_i)} + \alpha(3\mathcal{R}_i - 1)$$



$$A(\tau) = \int_{-\infty}^{+\infty} \mathrm{d}t y^*(t) y(t+\tau) = \int_{-\infty}^{+\infty} \mathrm{d}t y^*(t-\tau) y(t)$$

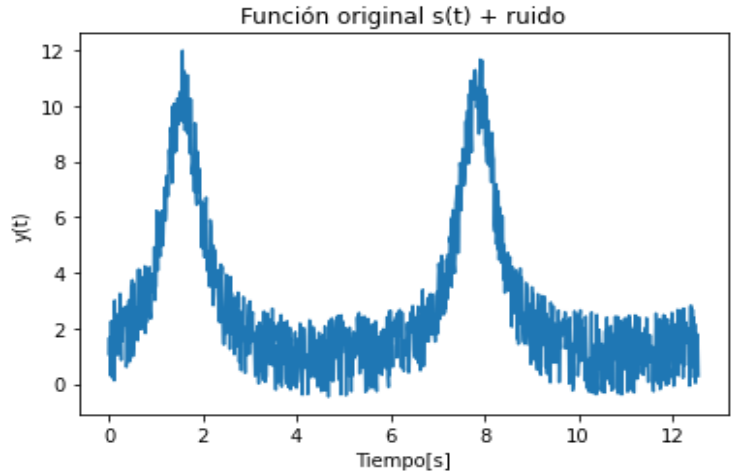
$$A(\omega) = \sqrt{2\pi}|S(\omega)|^2$$

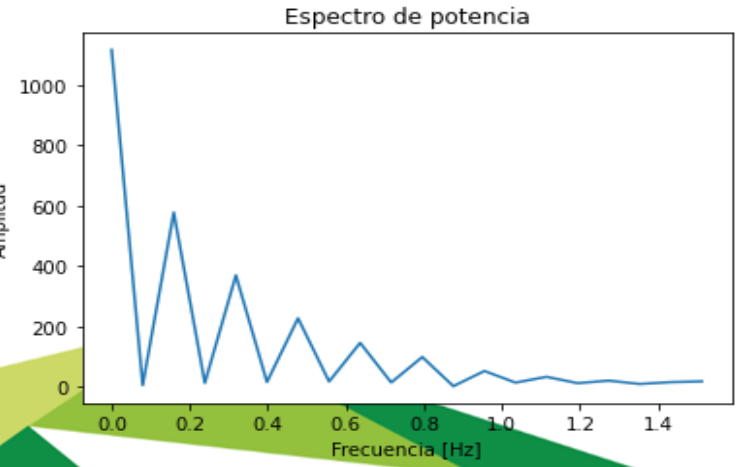


Variabilidad del Ruido

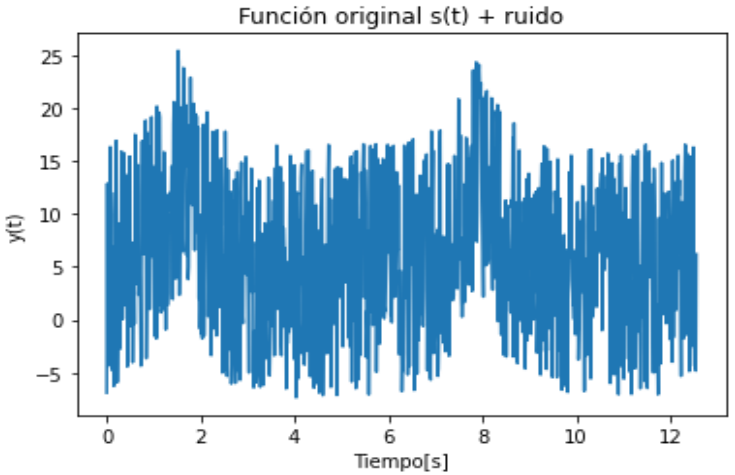
$$d = \sqrt{\int_0^T (f(x) - g(x))^2 dx}$$

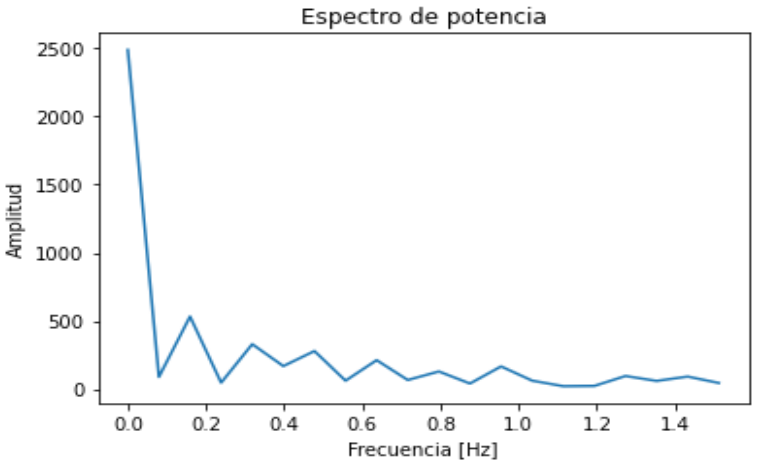
$\alpha = 1$



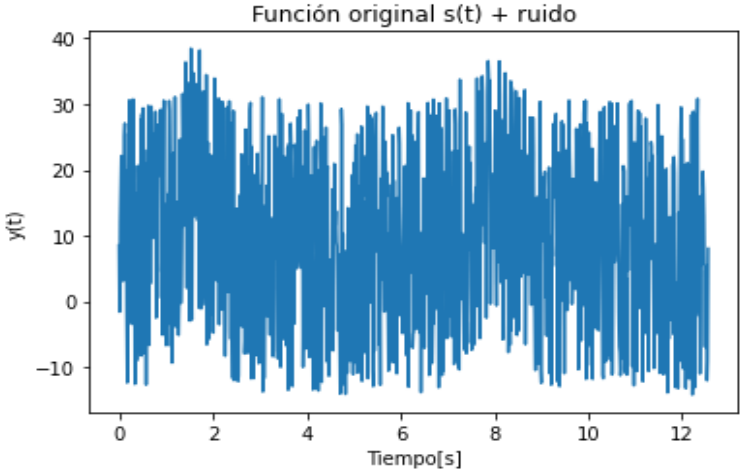


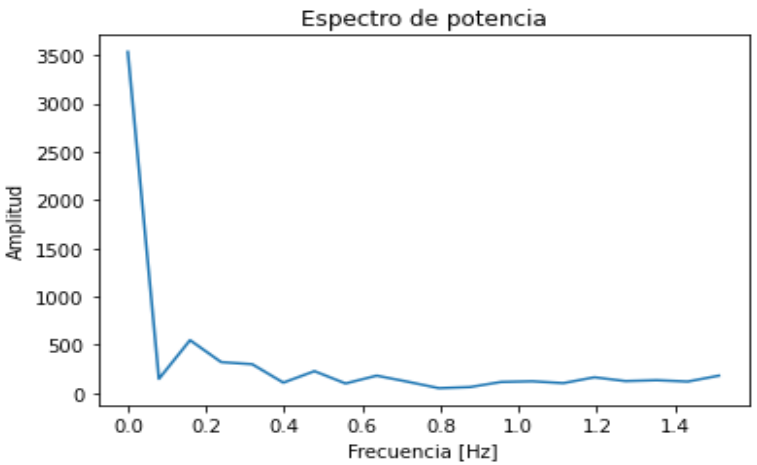
$\alpha = 8$





$\alpha = 15$

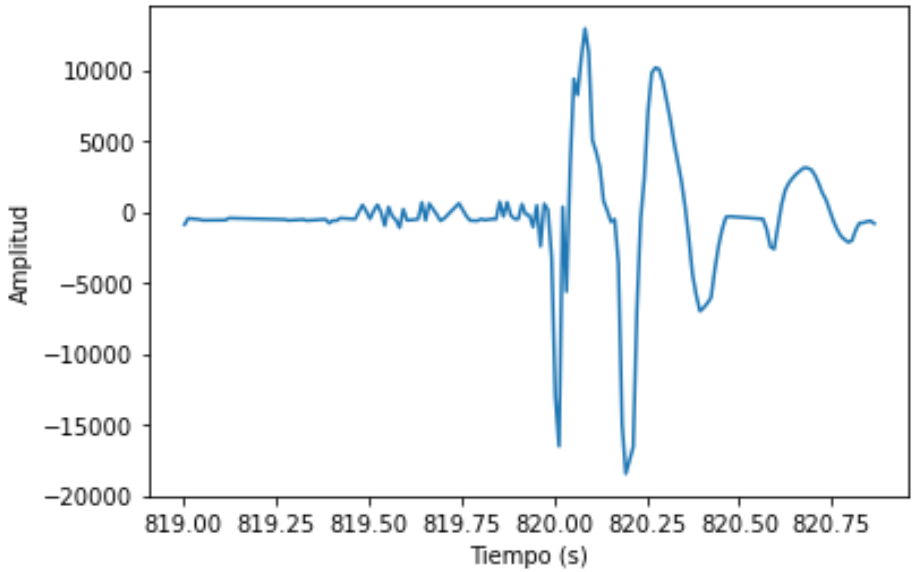




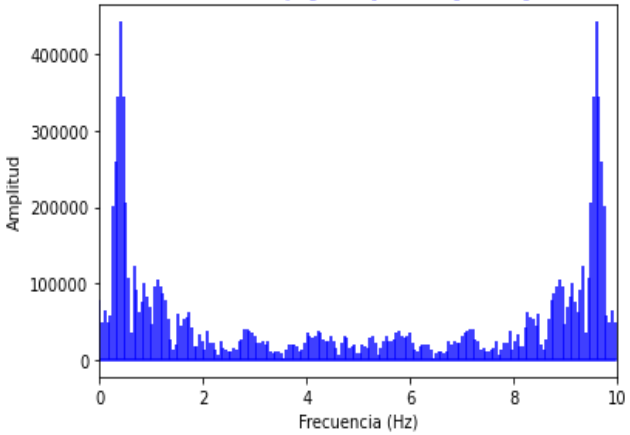
Transformada de Fourier de un Elve

Datos no equidistantes temporalmente.

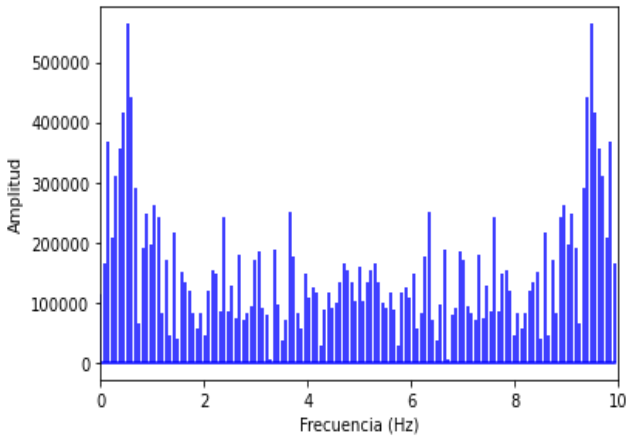
Interpolación.



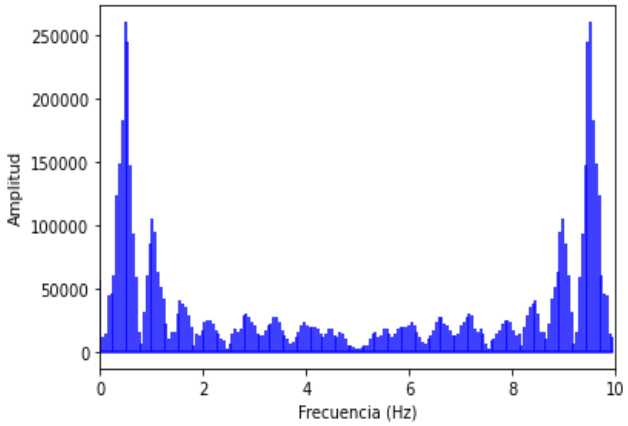
Antena R9RSR



Antena R9JNN



Antena R9PLT



Gracias!