

Single frequency

Physical parameters and natural frequency

$$K := 150 \cdot 10^6 \cdot \frac{\text{N}}{\text{m}} = 8.565 \times 10^5 \cdot \frac{\text{lbf}}{\text{in}}$$

stiffness and mass

$$\zeta := 0.05 \cdot 3 \quad \text{damping ratio}$$

$$M := 300 \cdot \text{kg} = 661.387 \cdot \text{lb}$$

$$f_n := \frac{\omega_n}{2 \cdot \pi} = 112.54 \cdot \text{Hz}$$

natural frequency and

natural period of motion

$$\omega_n := \left(\frac{K}{M} \right)^{.5} = 707.107 \text{ s}^{-1}$$

$$T_n := \frac{1}{f_n} = 8.886 \times 10^{-3} \text{ s}$$

$$C := \zeta \cdot 2 \cdot (K \cdot M)^{.5} = 363.392 \cdot \text{lbf} \cdot \frac{\text{s}}{\text{in}}$$

Damping coefficient

$$F_I := 100 \cdot \text{N}$$

$$\text{Random_} := \text{rnorm}(N_P, 0, 1)$$

$$T_M := \frac{T_{\max}}{1}$$

Sampling rate = MIN = 2 x max frequency

Sampling rate

$$\Delta_{\text{rate}} := 1000 \cdot 1 \cdot \frac{1}{s} \text{ samples/s}$$

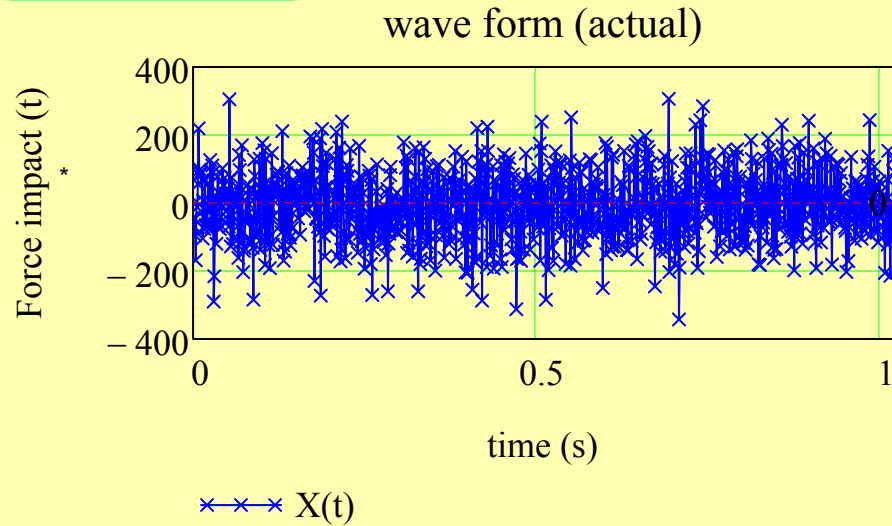
Number of samples

$$N_P := 2^{10} = 1.024 \times 10^3$$

1 YES, 0: NO $Y_{\text{window}} := 0$

$$T_{\text{max}} := (N_P - 1) \cdot \frac{1}{\Delta_{\text{rate}}} = 1.023 \text{ s}$$

Random Force vs time



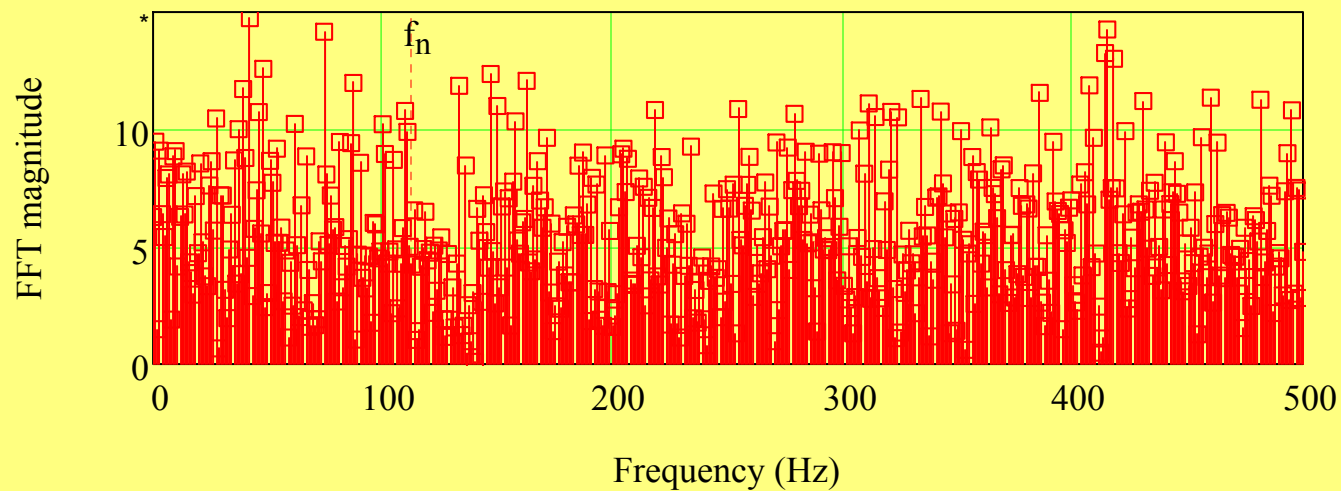
$$T_{\max} = 1.023 \text{ s}$$

$$\text{mean}(F_X) = -6.264 \cdot \text{N}$$

for graphs

$$\text{freq}_{\max} := 500 \cdot \text{Hz}$$

Amplitude of force in frequency domain



$$\Delta f = 0.978 \cdot \text{Hz}$$

$$T_{\max} = 1.023 \text{ s}$$

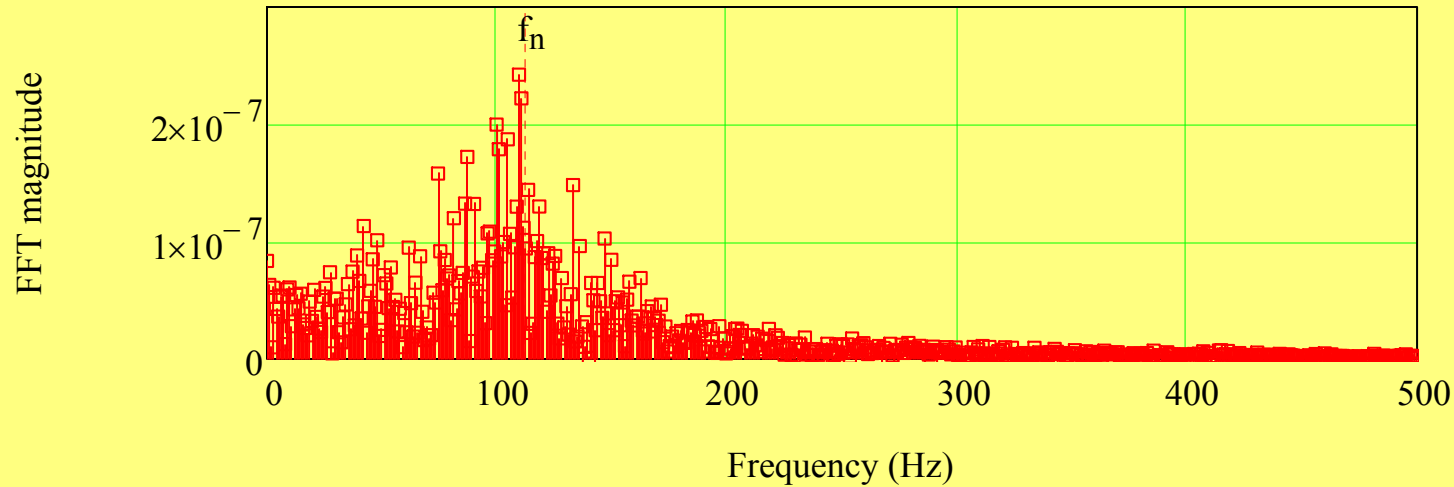


Build system response (frequency and time)

$$A_{\max} := \max(A) = 2.423 \times 10^{-7} \text{ m}$$

Amplitude of displacement in frequency domain

$$f_n = 112.54 \cdot \text{Hz}$$



(b) Time response

displacement vs time

$$\max(X) = 2.189 \times 10^{-6} \text{ m}$$

