



**Phase-shift Oscillator Values and Functions**

$$R_1 = 4.68k\Omega, \quad R_2 = 4.9k\Omega, \quad R_3 = 4.7k\Omega$$

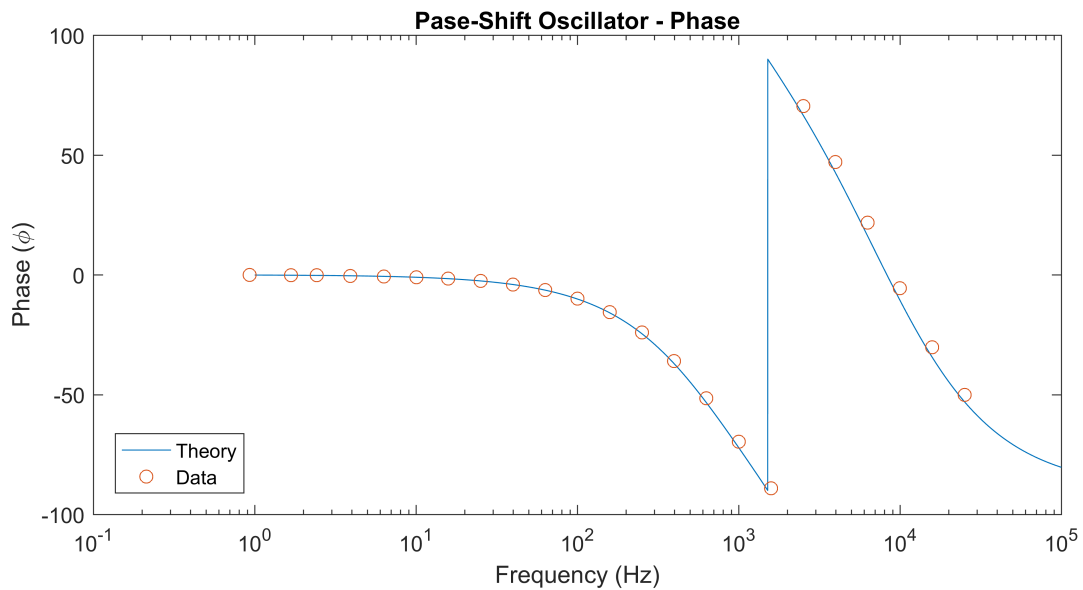
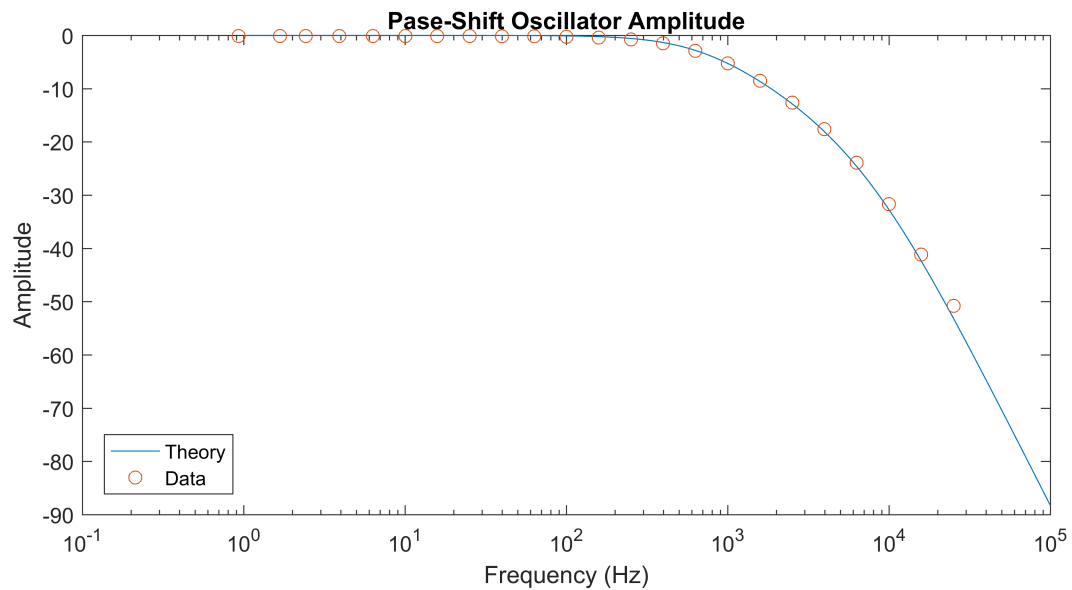
$$C_1 = 9.9nF, \quad C_2 = 9.9nF, \quad C_3 = 10nF$$

**DSA - Using op-am**

$$R_a = 100.1k\Omega, \quad R_b = 3.26M\Omega$$

**Function Used**

$$G = \frac{V_{out}}{V_{in}} = \left( \frac{V_{out}}{V_2} \right) \left( \frac{V_2}{V_1} \right) \left( \frac{V_1}{V_{in}} \right)$$



**Buffered Phase-shift Oscillator Values and Functions**

$$R_1 = 4.68k\Omega, \quad R_2 = 4.9k\Omega, \quad R_3 = 4.7k\Omega$$

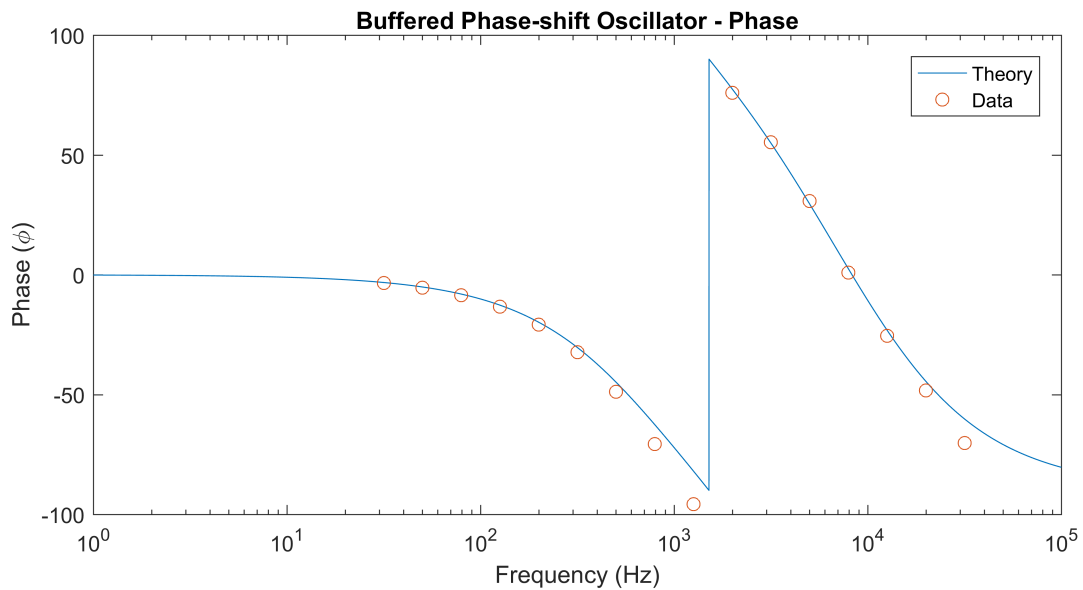
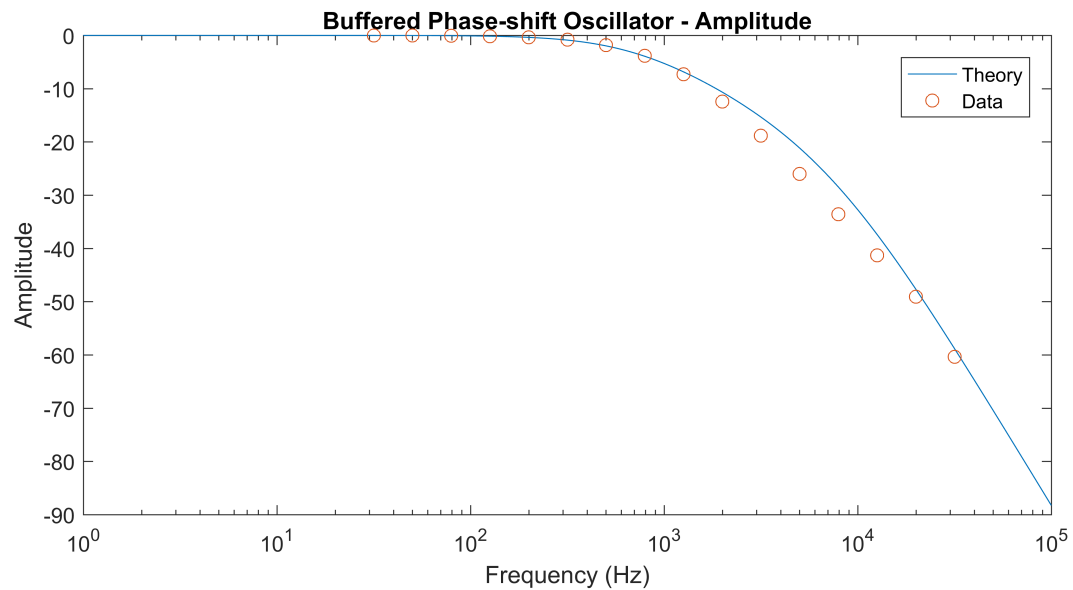
$$C_1 = 9.9nF, \quad C_2 = 9.9nF, \quad C_3 = 10nF$$

**DSA - Using op-am**

$$R_a = 100.1k\Omega, \quad R_b = 1.2M\Omega$$

**Function Used**

$$G = \frac{V_{out}}{V_{in}} = \left( \frac{1}{1+j\omega R_1 C_1} \right) \left( \frac{1}{1+j\omega R_2 C_2} \right) \left( \frac{1}{1+j\omega R_3 C_3} \right)$$



## DSA - Plots

