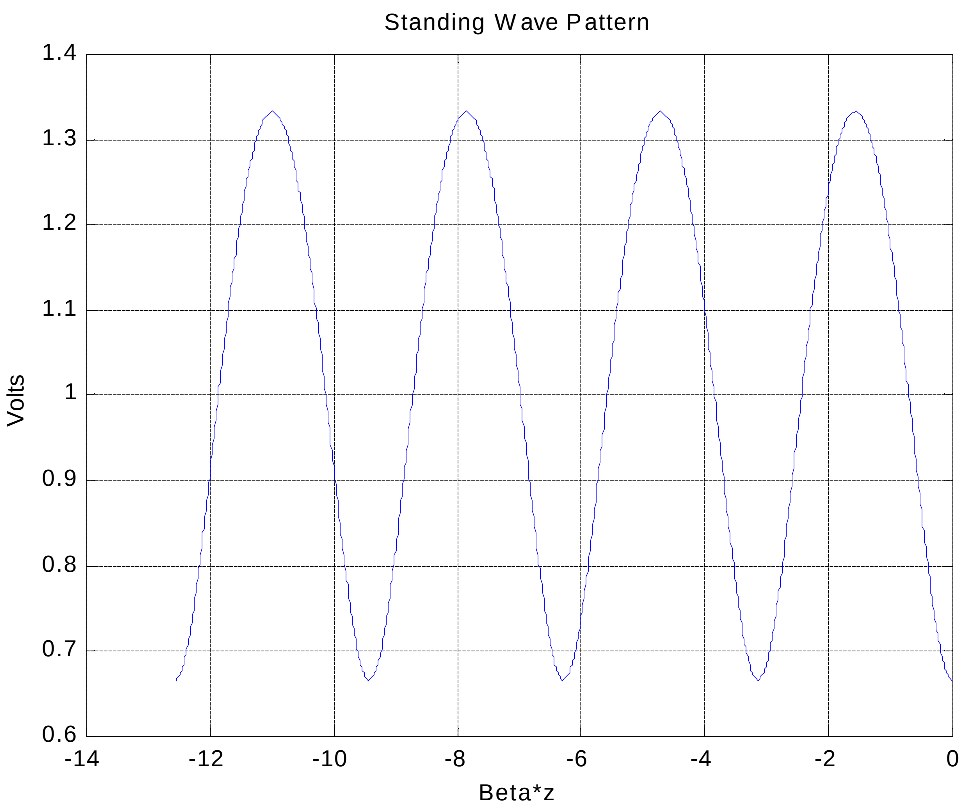
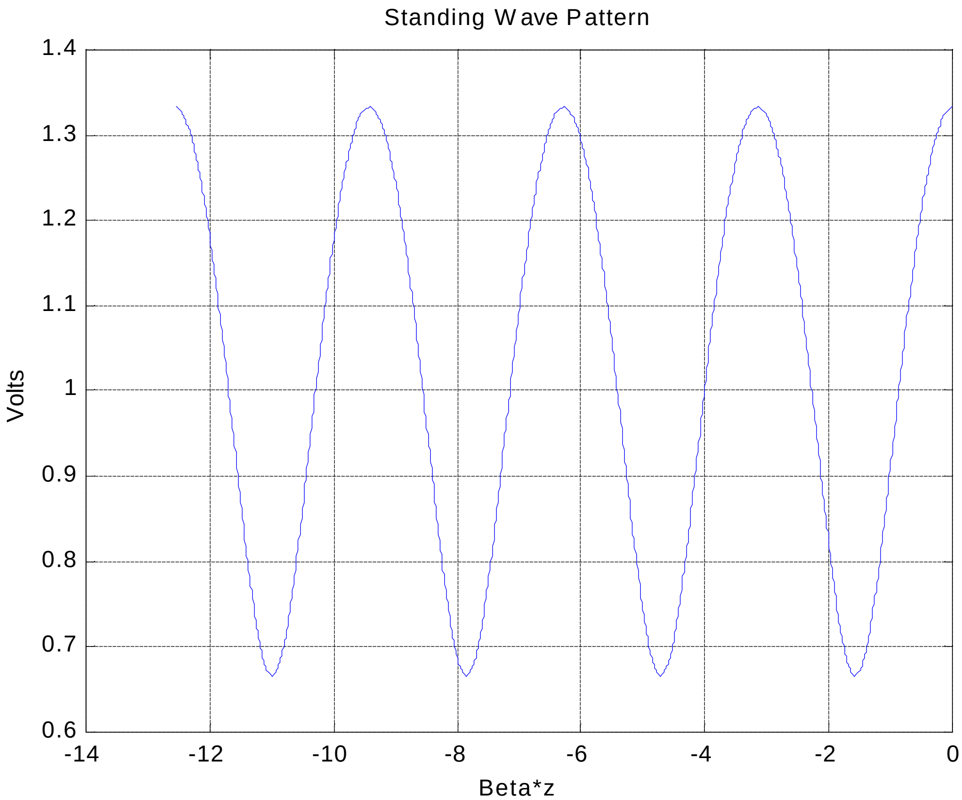
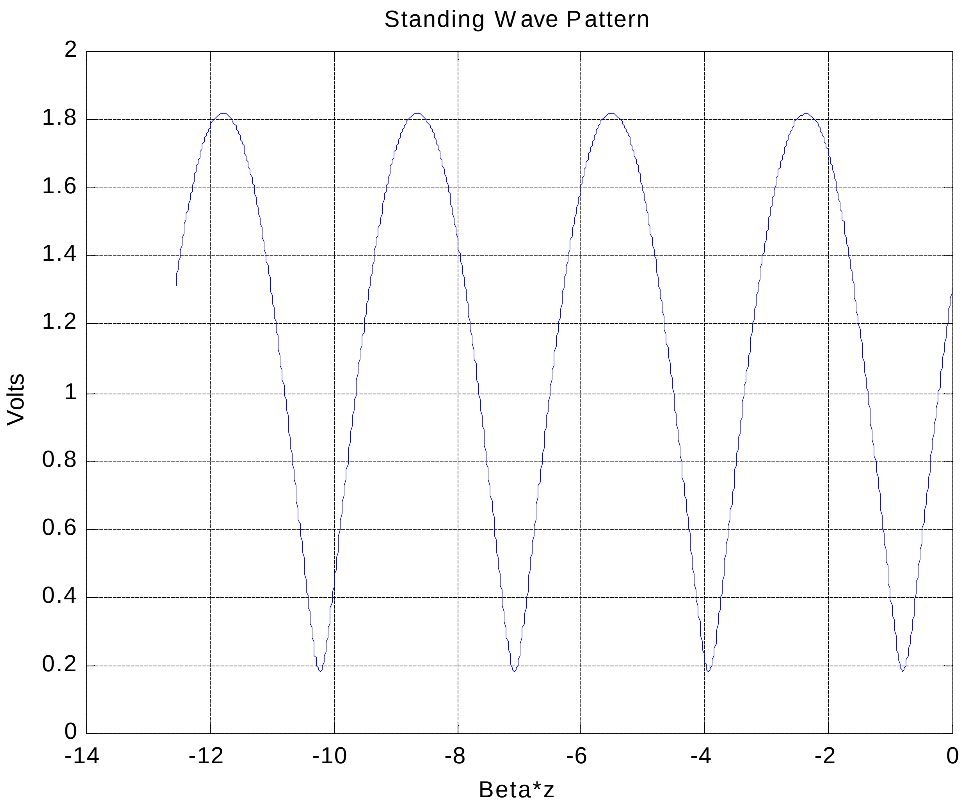
Some Examples of Standing Wave Patterns:

For a 50 ohm transmission line with an electrical length $\beta z = 4\pi$, the standing wave pattern can be determined from the absolute value of the voltage on the line written in phasor form $\hat{V}(z) = V_m^+ \exp(-j\beta z) + \Gamma_L V_m^+ \exp(+j\beta z)$, where $\Gamma_L = \dfrac{Z_L - Z_o}{Z_L + Z_o}$. The plots below are $\left|\hat{V}(z)\right|$ for loads of 25 ohms, 100 ohms and 10+j50 ohms, respectively. Note that since the load impedance is real and smaller than the characteristic impedance in the first case, there is a minimum at the load end of the line. In the second case, the load impedance is real and larger than the characteristic impedance and thus there is a maximum at the load end of the line. In the third case, the load impedance is complex so that there is neither a max nor a min at the load. The solution to problem 1 of Lesson 4.3 discusses a method for finding the minimum that is closest to the load. The phase of the incident wave must differ from the phase of the reflected wave by $-\pi$. Since the phase of the reflected wave includes the phase of the reflection coefficient the location z of the closest minimum is given by $-\pi + \theta_L = 2\beta z_{\min}$. For the third case, this gives $\beta z_{\min} = -0.88$ which agrees with the plot.




Standing Wave Pattern
Volts
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
-14
-12
-10
-8
-6
-4
-2
0
Beta*z


Standing Wave Pattern
Volts
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-14
-12
-10
-8
-6
-4
-2
0
Beta*z