

The modal theory for propagation in structures with constant anisotropic surface impedances as a boundary condition is developed for cylindrical waveguides and rectangular waveguides with vertical anisotropic surfaces. Dispersion diagrams for these waveguides are computed for various sets of surface impedances. The results are then validated by comparison, using commercial software. These results confirm a number of interesting properties of such waveguides with anisotropic surface impedances: the cutoff frequency can be drastically lowered, and left-handed mode propagation in a given frequency band can be obtained. The development of this theory can open the door to the development of new design tools for various applications using guided structures such as small waveguides, filters, positive phase shifters, or horns with excellent radiation properties.