Introduction

In the previous lessons, we have seen how to calculate the spectrum of a signal. In most cases, this spectrum is mostly limited around a certain range of frequencies. Depending on this range, we can define different types of signals. For example, if most of the energy of a signal is concentrated around zero (resp. $-\pi$ or $+\pi$) , we call it a lowpass (reps. highpass) signal. If the energy is concentrated somewhere in between we call it a bandpass signal.

Modulation is a method to shift the spectral content of a signal in frequency; for example, we can modulate a lowpass signal (such as voice) into a bandpass signal (such as an AM radio signal): modulation is at the heart of most communications systems. A modulated signal can be demodulated back to its original position in frequency.

For fun, we will also show how modulation can be used to tune a guitar. Maybe you have already done it yourself or you have heard musicians do it on stage. Now you will understand the theory behind it.