

# beats

December 31, 2020

## 1 Exploring Beat Frequencies

This simple notebook will let you play with close frequencies and hear the beatings created by intermodulation. It's also a cute example of the interactivity you can achieve with notebooks.

```
In [1]: # standard bookkeeping
        %matplotlib inline
        import matplotlib.pyplot as plt
        import numpy as np
        from IPython.display import Audio, display

        # interactivity here:
        from ipywidgets import interact, interactive, fixed, interact_manual
        import ipywidgets as widgets
```

```
In [2]: plt.rcParams["figure.figsize"] = (14,4)
```

Let's define a simple fuction that generates, plots and plays two sinusoids at the given frequencies:

```
In [3]: def beat_freq(f1=220.0, f2=224.0):
        # the clock of the system
        LEN = 4 # seconds
        Fs = 8000.0
        n = np.arange(0, int(LEN * Fs))
        s = np.cos(2*np.pi * f1/Fs * n) + np.cos(2*np.pi * f2/Fs * n)
        # start from the first null of the beating frequency
        K = int(Fs / (2 * abs(f2-f1)))
        s = s[K:]
        # play the sound
        display(Audio(data=s, rate=Fs))
        # display one second of audio
        plt.plot(s[0:int(Fs)])
```

```
In [4]: interact(beat_freq, f1=(200.0,300.0), f2=(200.0,300.0));
```

A Jupyter Widget

```
In [ ]:
```

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In [ ]:
```