

ANALOG LAB 2021

EE2401

Experiment 8: Mixer

1. Frequency translation is an important operation in wireless systems. As we already know, a linear time-invariant system can never produce a signal with frequency different from the input signal frequency. Mixing is a process of multiplying different signals to obtain a signal at new frequency. In this experiment, our aim is to design a circuit which can multiply an input voltage signal with a known periodic signal to result in a known frequency translation of the input signal. Use the following constraints to design a mixer circuit:

- Input signal frequency: 1 kHz
- Known periodic signal: 10 kHz output from the oscillator designed in Exp. 5
- Use these devices for mixer circuit: BJTs (2N3904, npn and 2N3906, pnp), diode (1N4148) in addition to ideal passive components

(Hint: V-I relationship of semiconductor devices when expressed as a polynomial has many high order terms. Use it to get current which depends on product of voltages and then convert the current back to voltage.)

Use FFT function in LTspice to find frequency component of various signals.

CAD info:

- PSPICE models can be used in LTspice using this procedure: <https://www.analog.com/en/technical-articles/ltspice-simple-steps-to-import-third-party-models.html>

Submit the following:

- Hand calculation and reasoning
- Testbench snapshot, output time domain and FFT plots
- Any undesired behaviour along-with comments