

Analog Project



Component

École Nationale
Supérieure
d'Électrotechnique
d'Électronique
d'Informatique
d'Hydraulique
et des
Télécommunications

In brief

- > **Amety's Code:** N7EE07C
- > **Open to exchange students:** Yes

Presentation

Objectives

The objective of the project is to transmit an audio signal (speech or music) over a distance via a wireless link. This is achieved using an infrared optical beam ($\lambda=900\text{nm}$) transmitted through the air. In addition to the audio source (e.g., a cell phone) and the speaker or headphones, the device comprises two units: a transmitter and a receiver.

Description

The transmitter mainly comprises a voltage-controlled oscillator (VCO) whose frequency varies linearly with the amplitude of the input signal. The center frequency f_0 must be relatively high compared to the highest FM audio frequency of the signal to be transmitted. The light flux containing the information to be transmitted is emitted by a high-efficiency light-emitting diode (LED) whose intensity is proportional to its instantaneous bias current in the modulation frequency range. A preamplifier-filter processes the audio modulating signal to be transmitted before applying it to the VCO input.

The receiver has a silicon PIN photodiode at its input, whose spectral response is adapted to the LED's emission spectrum. This photoreceptor generates a photoelectric current proportional to the intensity of the received light flux. The photoelectric current is amplified by a transimpedance circuit, which produces an output voltage proportional to the input alternating current. A high-gain selective amplifier amplifies the photoelectric signal and feeds it to a discriminator, which performs the frequency-to-voltage

conversion. A phase-locked loop (PLL) is used for this purpose. After filtering the audio signal, a class AB push-pull audio amplifier drives a loudspeaker or headphones.

Pre-requisites

Signal transistors and power components

Transistor amplifier circuits

Continuous linear systems automation

Methods of analyzing electrical circuits