Analog Project

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

In brief

- **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 (λ=900nm) 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 f0 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