Analysis of a passive component signal by means of optical coherence tomography system

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The main property of a passive component as an electro-optical modulator (EOM) using in an optical coherence tomography system (OCT) lies in the capacity to produce deep amplitude modulation of the laser with a high modulation frequency [1]; furthermore it can generate different polarization states to analyze optical properties of biological samples [2]. Due to the characteristics of the EOM's, they have been used in different scientific fields [3]. There are some efforts to characterize the optical properties of such devices [4], but as far as we know, there is not a report of how its characteristics can affect the original signal produced by an OCT system. The purpose of this research is to analyze how the changes in the optical properties of the EOM affect the measurements of an OCT system.

Figure 1 shown an OCT system built for this proposal. The light from the source was coupled into a single-mode optical fiber to a bench. After the bench, the light passed through an optical isolator. Then, the collimated beam passed through an electro-optic modulator (EOM) to induce amplitude modulation of the signal. After that, the light was divided by means of a beam splitter fiber coupled 50/50. The resulting recombined light produced an interference pattern which was detected by a spectrometer; in this case, the sample is a mirror.

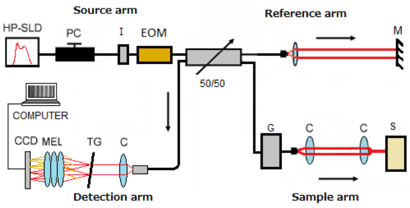

Figure 1. OCT setup.

The experiment was divided into two parts. In the first one we measured the modulation of the light at the output of the EOM which the signal detected is shown in Fig 2 a) in red color (EOM), the signal in black color (FG) represents the signal applied to the EOM for modulation and finally the blue signal (OCT) is obtained in the second part of the experiment when this signal is measured on the output of the spectrometer; all measurements were normalized by their own maximums. In Fig 2 b) we calculated the Fourier transform of all signals. The FFT shows a displacement of the frequency of the OCT signal with respect to the EOM signal; It seems that the frequency shift between the FG and the EOM signal is minimum.

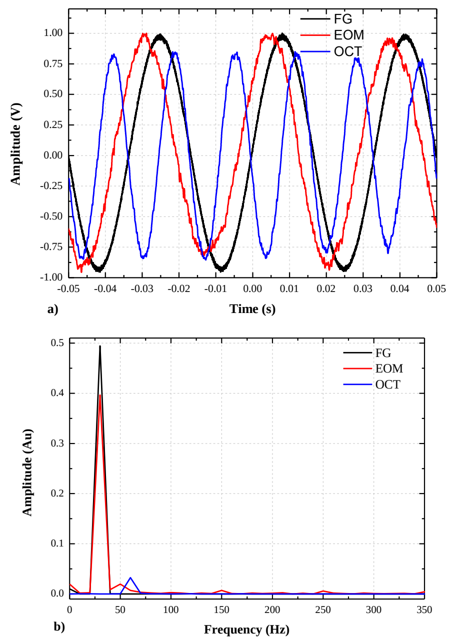

Figure 2. Waveforms of the signals detected (a) and its respective Fourier transform (b).

The OCT signal includes the interference pattern and the modulated signal of the EOM; as a consequence of this, we have to figure out how we can discriminate both signals; more research has to be done in this direction.

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