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OMW

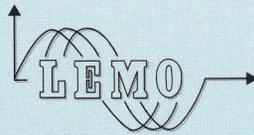
Interactions between Microwaves and Optics



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OPTICAL LINK SIMULATION

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Techniques for the modeling of analog and digital communication systems fall into two classes. Those based on component aspect, those based on system aspect. An approach of these techniques applied to optical fiber link is given in this paper and some simulation results are presented. The modeling by component aspect introduces a comparison between two laser diodes with and without packaging. The actual simulations are carried out by the software package COMSIS. It allows to adjust parameters for semiconductor laser, optical fiber and p-i-n photodetector.

The system block diagram of an optical link is shown in **figure 1**. Modeling of component asks a knowledge of different parameters. These are known for optical fiber and p-i-n photodetector but unknown for laser diode in manufacturer data. In this case, parameters have to be adjusted to obtain same characteristics as measurements (static characteristic and frequency response).

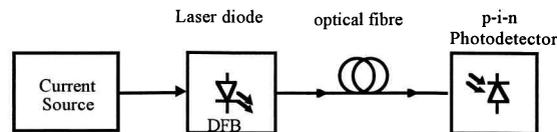


Figure 1.

These characteristics have been measured and simulated for two different DFB laser diodes. One of them is a packaged Philips laser diode (LD) emitting at $\lambda=1.3\mu\text{m}$ and the other one is a Thomson laser diode chip emitting at $\lambda=1.5\mu\text{m}$ (without packaging). The frequency response is hard to model because of the resonance of the packaging for the Philips LD, and the Thomson LD has some parasitics which can't be modeled with the software (**figure 2**). Nevertheless, the static characteristics are well modeled.

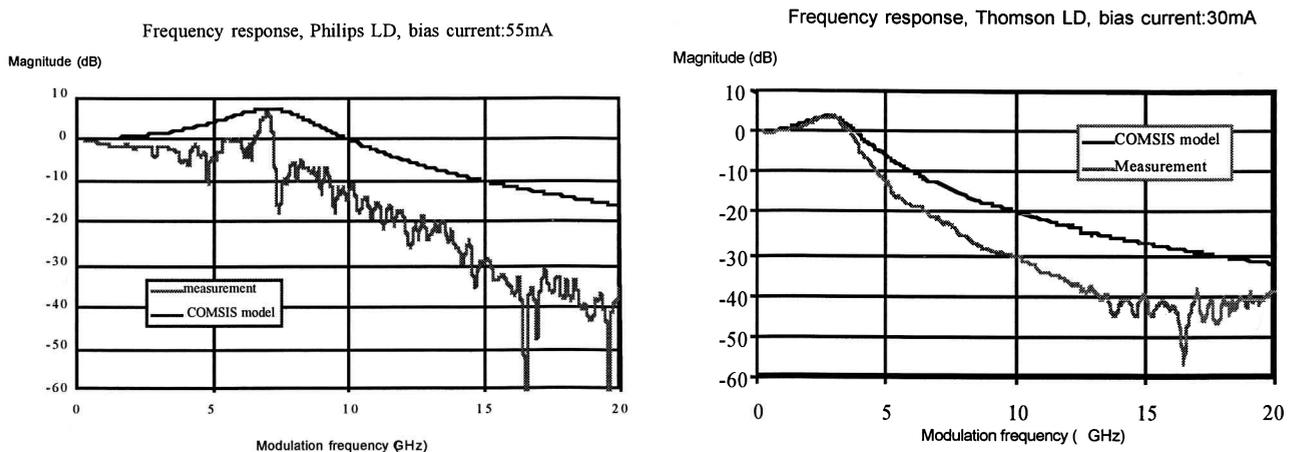


Figure 2.

The link may be correctly modeled if the microwave spectrum at the output of the simulated p-i-n photodetector is the same as the measured one. This condition is not always fulfilled when the modeling is based on component aspect. In this case, the system aspect must be considered, that is the interesting signal isn't the one at the output of the component anymore but at the output of the link. The laser diode parameters are modified to obtain the right spectrum. Fiber and photodetector parameters aren't modified, because in simulation these components don't introduce non-linearities, only laser diode parameter can have an influence on the microwave spectrum.

A good modeling of the optical link allows to make interesting numerical simulation with COMSIS. In further investigation, different signal processing devices will be added to the link. Noise will be introduced in our model and the BER (Bit Error Rate) will be measured.



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