Successful design of integrated color sensors using Buried Double pn Junction (BDJ) detectors requires a reliable model that describes accurately the BDJ behavior. In order to improve the BDJ physical model, we adopted a new modeling approach. The approach gives good agreement between simulation results and measurements carried out on a CMOS test circuit.

**BDJ color detector**

In a standard n-well CMOS technology, the BDJ color detector structure consists of two buried pn junctions. Under illumination and reverse bias conditions, two currents $I_1$ and $I_2$ flow through the structure (Fig.1). Each current has two components, the dark current component and the photocurrent one. The photocurrents spectral responses present two peaks: one in the blue wavelength region and the other in the red one. The current ratio $I_2/I_1$ shows a monotonically increasing function with the wavelength. Thus, both wavelength and optical power of a monochromatic light can be determined.

**Modeling approach**

The approach we adopted takes into account the physical phenomena that intervene to form the BDJ dark and photo-generated currents. It consists also on experimental extraction of some physical and electrical parameters by using the C-V technique. The experimental procedure consists of measuring the depletion capacitance of the BDJ shallow and deep junction versus reverse bias. By exploiting the C-V experimental curves (Fig.3 and Fig.4), some physical and electrical parameters are determined.

**Simulation and experimental results**

The approach is evaluated by comparing simulation results of both dark and photo-generated currents to measurements carried out on a CMOS test circuit (Fig.2).

1. **Dark currents**

   Good agreement is obtained between simulation results and measurements (Fig.5).

   Dark current of shallow junction exhibits a wide variation versus reverse bias. This is due to the non-negligible contribution of generation and tunneling phenomena.

2. **Photocurrents**

   Both experimental data and simulation results obtained in previous works are plotted against our simulations.

   We note that experimental curves give best fit to our simulations compared to that of previous works (Fig.6). This is confirmed by the photocurrents ratio plots (Fig.7).

   To evaluate our model accuracy, we calculated at every wavelength the relative error between simulation and experimental results. By using our modeling approach the difference is reduced. It is about 1% in the wavelength range 490nm to 750 nm (Fig.8).

**Conclusion**

A new approach has been proposed in order to develop a reliable model that describes accurately the BDJ color detector behavior. To validate the model, measurements of the dark and photogenerated currents are carried out on a CMOS test circuit and compared to the simulation results. We note that using our approach the difference between simulation and measurements is reduced.