# ICEM Modeling of Microcontroller current activity

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The principle of this method consists in determining the internal current activity directly from the measurement of the external current. The method is summarized in the figure 1.

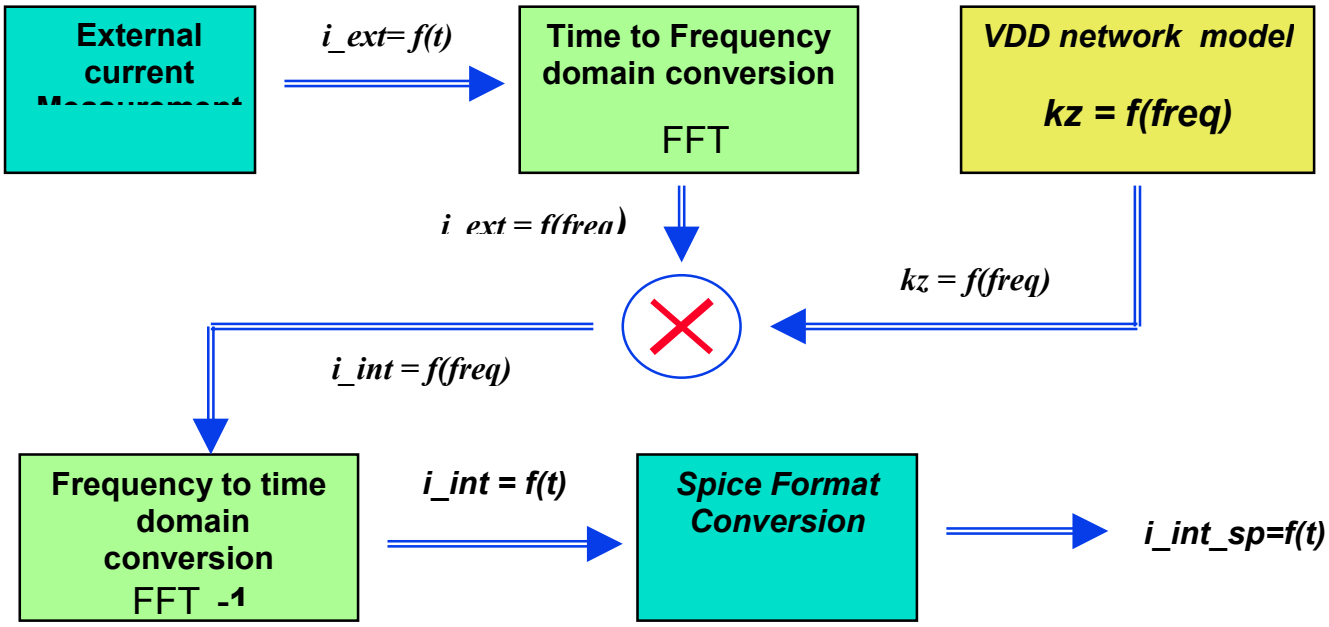


**Figure 1 Modeling method**

The electrical circuit used for the Spice simulation is given in figure 2.

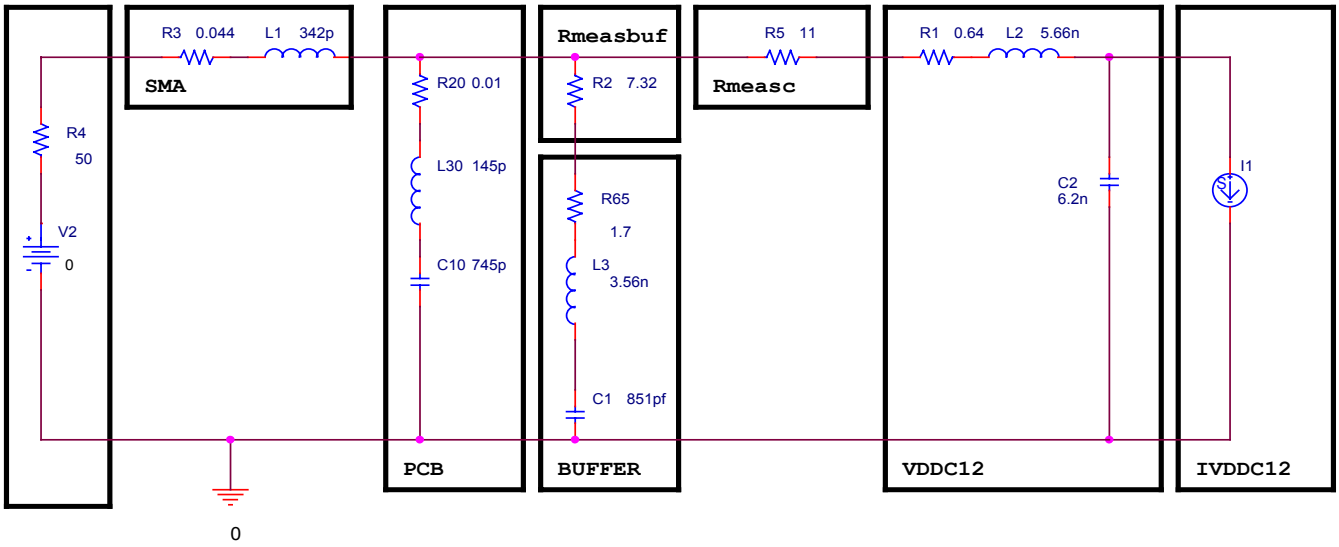


Figure 2. Spice model for extracting the current model of the microcontroller core.

Figure 3 compares simulated and measured results. The microconntroller is maintained under reset state. The current measured across the Rmeasc resistor, *I_ext*, is plotted in red and is simulated in green.

There is a good correlation with a little offset due to the computing noise of the FFT and FFT-1.

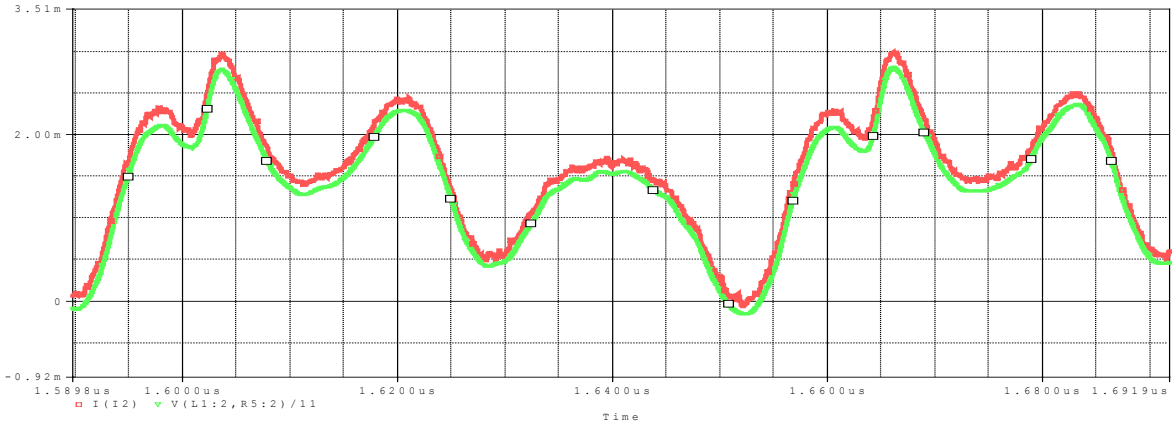


Figure 3. Plot of the i_ext current: Red measurement, Green simulation.

Figure 4. plots *i_int* (red) computed by the method described in figure1. This plot shows some current pics due to the internal activity of the microcontroler and synchronised to the clock.

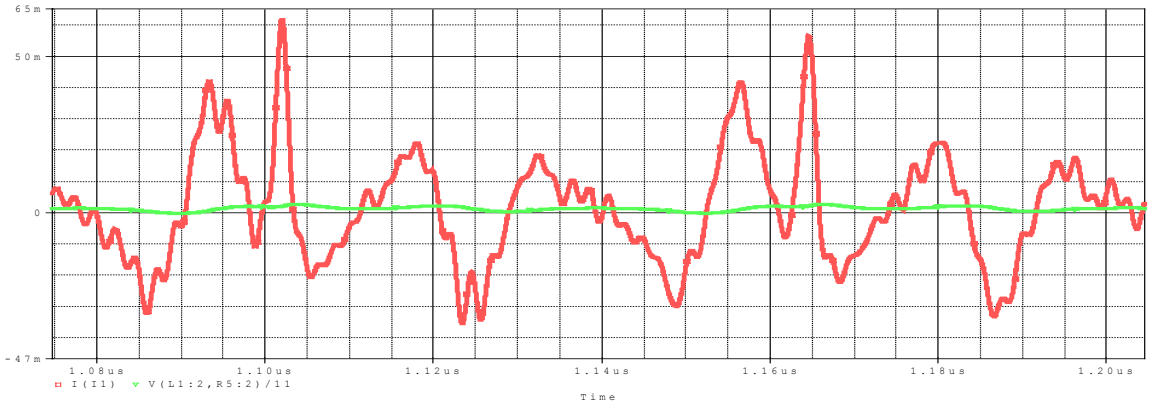


Figure 4. Plot of *i_int* current in Red and *i_ext* in green.

Figure 5 shows the electrical schematic used to predict the current *i_ext* across the Rmeasbuf.

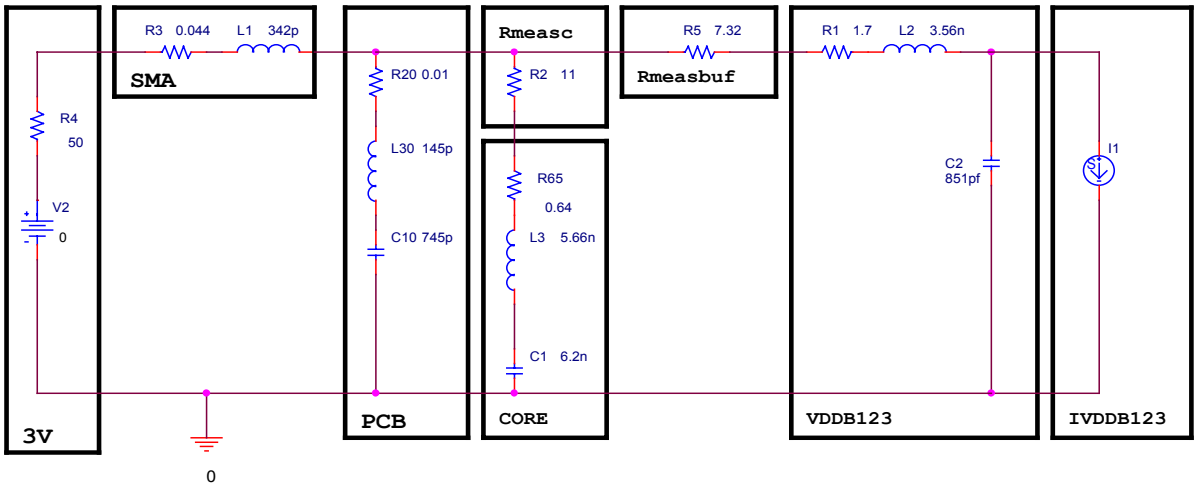


Figure 5. Electrical schematic for predicting the *i_ext* of the buffer.
Figure 6 shows the correlation between the measurement and the simulation of *i_ext*. There is a very good correlation between both traces.

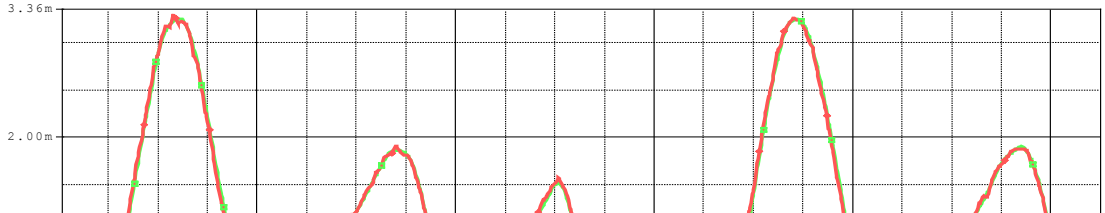

Figure 6. *i_ext*, measurement in red and simulation in green.

Figure 7 plots the *i_int* current computed with the method described in figure1 and I_ext current measured across the Rmeasbuf.

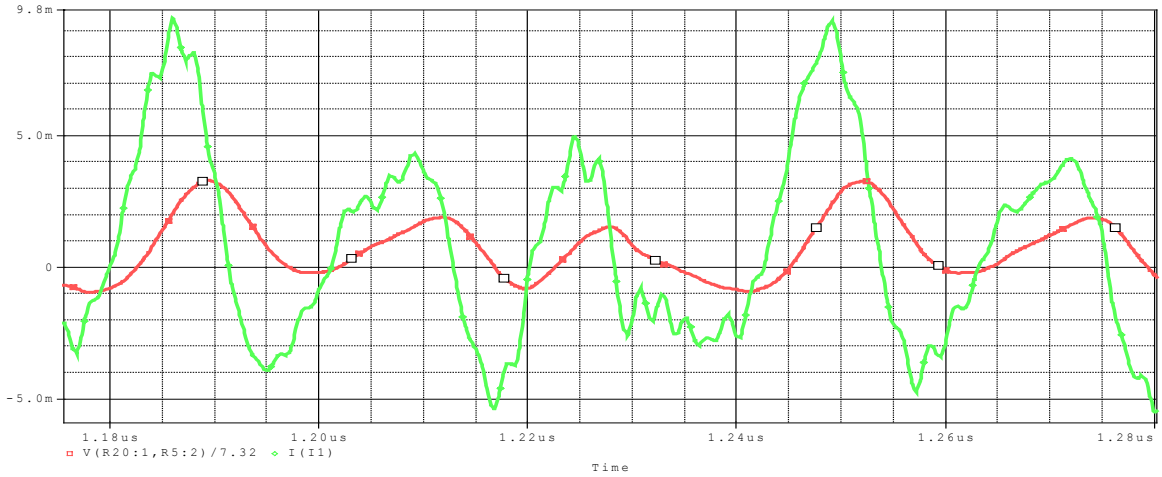


Figure 7 *i_int* in green, *i_ext* in red.

These first results shows the accuracy of the modelling method which allows to isolate the current activity of the silicon alone.