DC-Bus Voltage Control in Controlled DC-Voltage Power Port. "A complementation to Real-Reactive Power Control in a Three-Phase Inverter (alfa-beta)"

The project titled "Real-Reactive Power Control in a Three-Phase Inverter (alfa-beta)" presents a DC power source at the three-phase DC side. This power source may vary its amplitude due to an external disturbance. Therefore, it is recommended to establish a constant and controlled voltage in such point. This may be achieved by controlling the voltage drop at the three-phase DC-bus capacitor.

The Fig. 1 presents a simplified block diagram for the simulated topology. So, the objective here is to control the VDC voltage. The Third Harmonic Injection is not implemented.

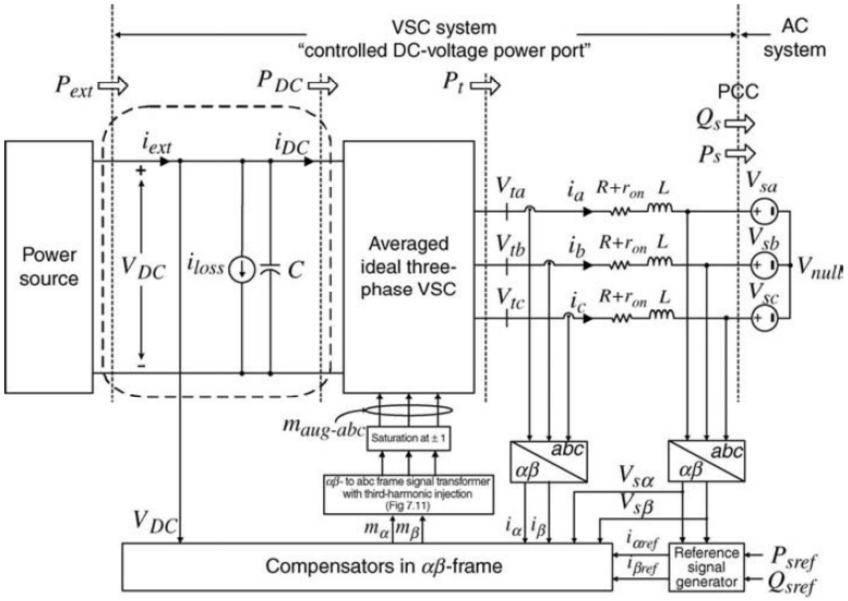

Figure 1: Simplified block diagram. Source: Voltage-Sourced Converters in Power System: Modeling, Control and Applications. By A. Yazdani and R. Iravani.

The Fig. 2 presents the control block diagram implemented to control the VDC voltage. All the design steps and the details about this control diagram is presented in the complementary material. The VDC_ref value is 1450V.

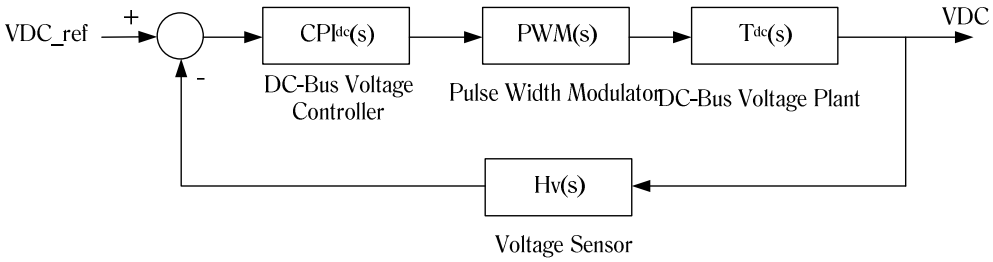

Figure 2: Control block diagram,

The Fig. 3 presents the simulated Circuit. (This is a High-Resolution Figure. Make zoom to visualize details). The DC-Bus Voltage controller is inside the gray box.

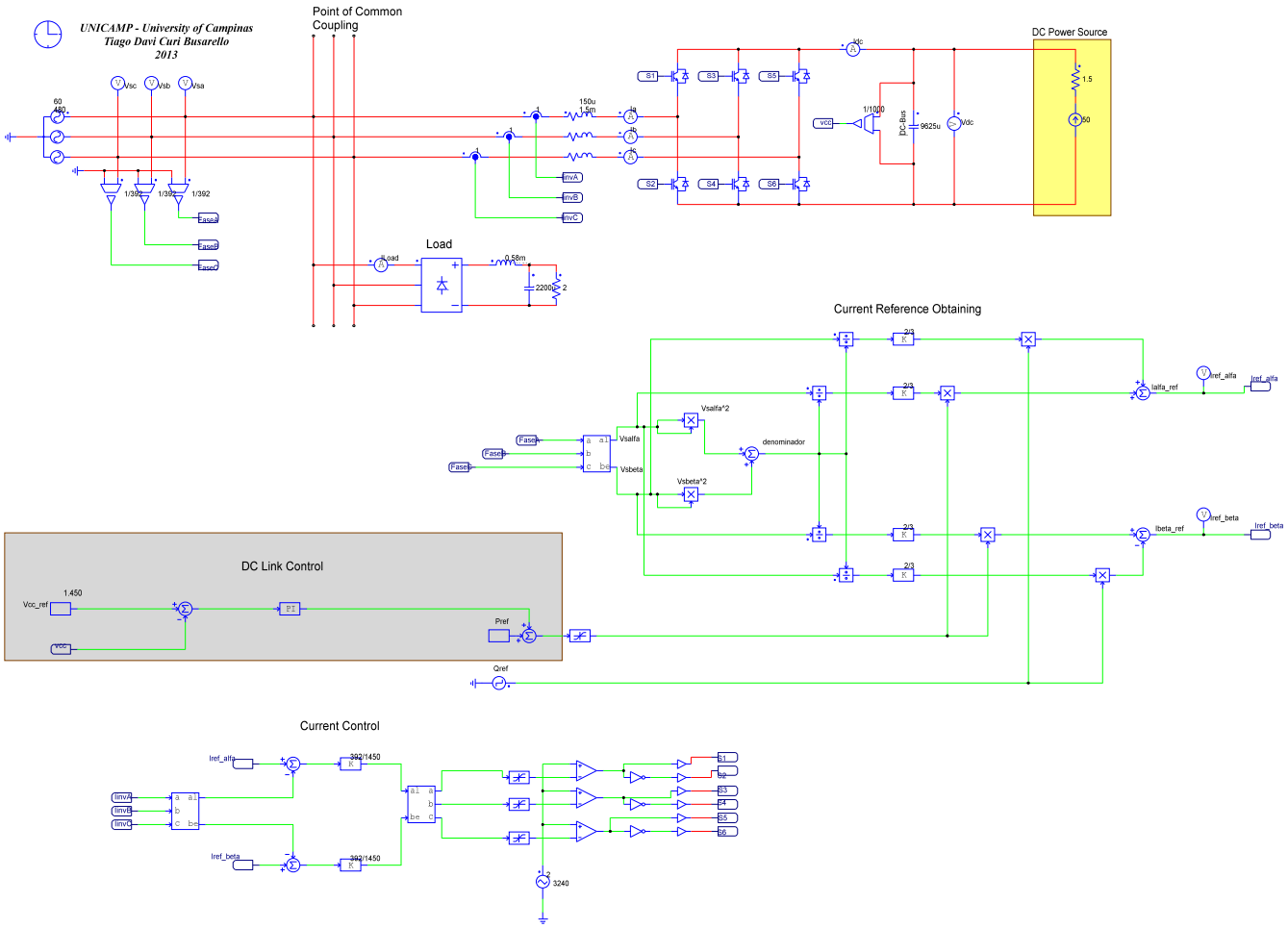

Figure 3: Simulated Circuit.

The Fig. 4 presents the Three-phase inverter current and the DC-Bus voltage during a reactive power reference step (at t =30s). It is possible to verify the DC-bus control efficacy.

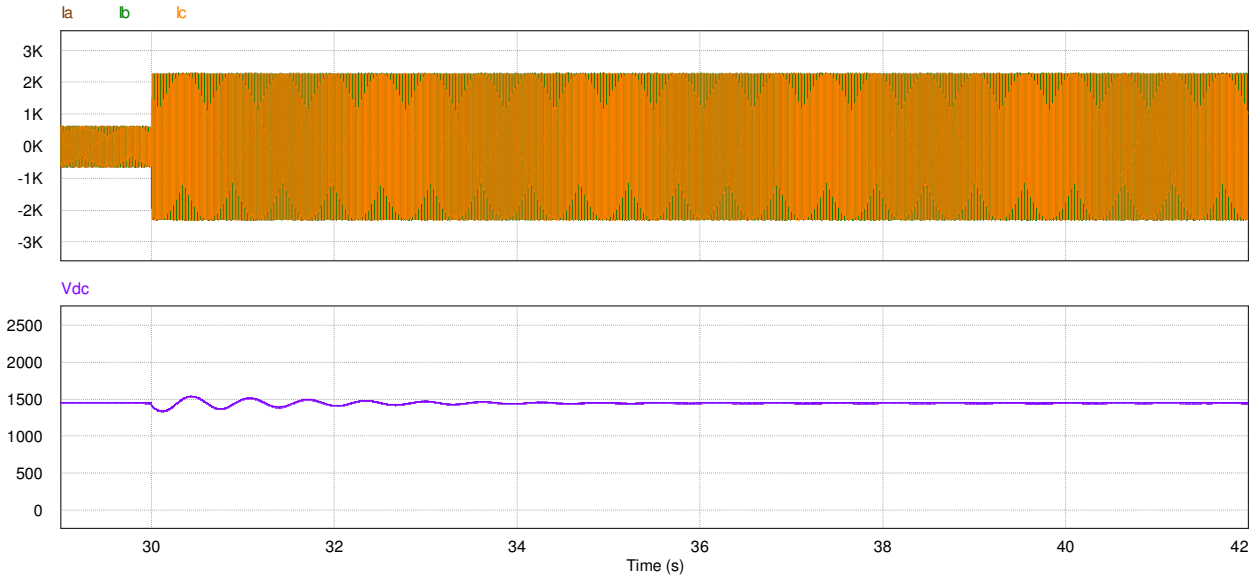

Figure 4: Three-phase inverter current (above) and DC-Bus voltage.

The Fig. 5 presents three-phase inverter current in detail during the step. Now, the voltage for phase A is placed in order to notice the displacement in the angle between the voltage and the current for phase A.

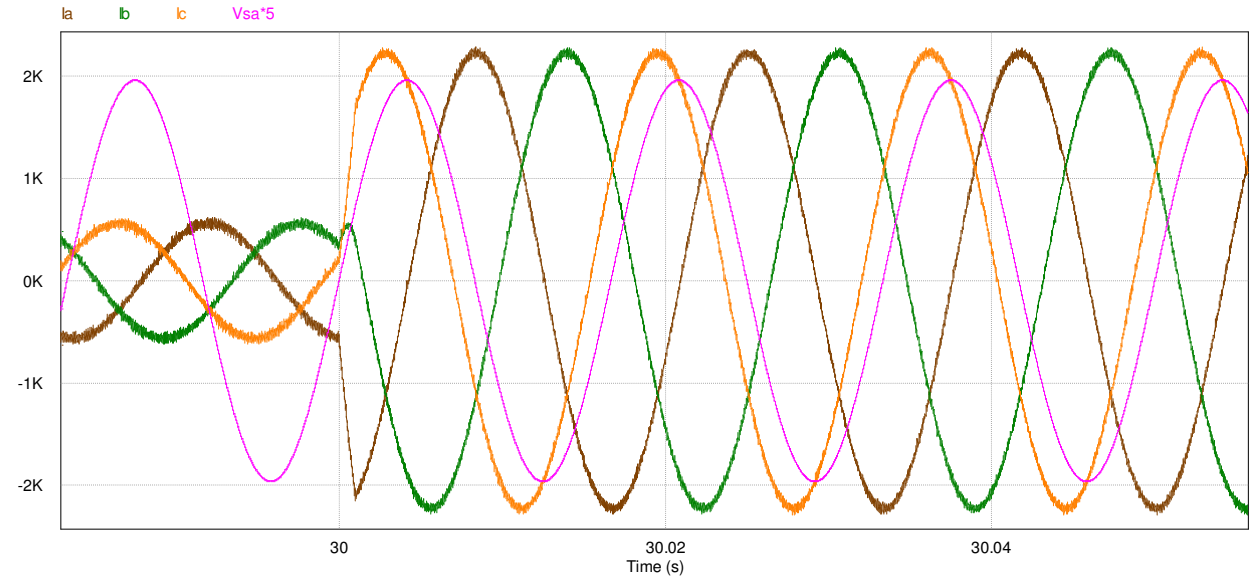

Figure 5: Three-phase inverter current during the step.