ABSTRACT

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Phase-Locked Loop (PLL) synchronization circuits have contributed for the improvement to modern power grids in most of their aspects, such as chain generation, identification and characterization of contents related to power quality, fault location, among others. Particularly, when PLL is used in single-phase circuits, there is an inhe-rent presence of the second harmonic component from the fundamental frequency of the grid voltage. This feature compromises the PLL performance and, therefore, several solutions to minimize this problem has been proposed. The alternatives presented so far are the proposal of new control loops including auxiliary signals to eliminate this oscillating component when the PLL is in the steady state condition, as long as the input signal is not distorted. These PLLs are known as the OSG-PLL (Orthogonal Signal Generator - Phase Locked Loop). However, single-phase OSG-PLLs do not present fast dynamic response without compromising the quality of the signal generated. Thus, in this work we explore the combination of OSG-PLLs with digital tuned filters. The objective is to identify arrangements that present a faster dynamic response, without compromising the quality (harmonic distortion) of the generated signal. These conditions are presented in detail in this dissertation. Simulation and experimental results of different OSG-PLL, together with digital tuned filters, were explored. Furthermore, there is also a comparison of their performances involving time-response due to a transient event and the harmonic distortion of the output signals when those PLLs are in steady-stade condition.

Keywords: Phase-Locked Loop; Digital Filters; Harmonic Distortion; Settling Time; Single-phase circuits.