

# Efficient multiple-reference-frame controller for harmonic suppression in custom power devices

M. Ochoa, J. Roldán-Pérez, A. García-Cerrada, J. Zamora

**Abstract**— Tracking harmonic currents and voltages in electric power systems with custom power devices exceeds the capabilities of conventional Proportional+Integral controllers and more sophisticated algorithms are required, especially under grid-frequency variations. This paper presents a control method based on multiple reference frames for harmonic control in the context of a series active power filter. The proposed scheme allows recursive calculation when referring signals to reference frames rotating synchronously with harmonic equivalent space vectors whilst a minimum of trigonometric-function evaluations are required. Furthermore, the control of each harmonic can be dealt with using simple integral controllers applied to the transformed signals. The paper presents the closed-loop-stability analysis and experimental results of a series active power filter. A scenario with grid-frequency variations is considered to show the intrinsic adaptation capability of the proposed controller.

**Index Terms**— Voltage control; Custom power devices; DVR; Active filters; Harmonics; Synchronous reference frames

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**Citation:**

*Ochoa, M.; Roldán-Pérez, J.; García-Cerrada, A.; Zamora, J.; "Efficient multiple-reference-frame controller for harmonic suppression in custom power devices", International Journal of Electrical Power & Energy Systems, vol.69, pp.344-353. July, 2015.*