

# Mathematical Model and Experimental Results of a New PWM (Pulse Width Modulation) Technique With Frequency Carrier Modulations.

Antonio Ruiz Gonzalez, Francisco M. Perez-Hidalgo, Mario J. meco Gutierrez,  
Francisco Vargas-Merino  
Electrical Eng. Dpt University of Malaga  
afruiz@uma.es, fmperez@uma.es, mjmeeco@uma.es, fvargas@uma.es

Juan R. Heredia-Larrubia  
University of Malaga Electronic Technology Dpt  
jrheredia@uma.es

## Abstract

There are many applications with power inverters connected to transformers. The classic form of control of power inverters is by PWM. In most cases it is necessary to use filters to reduce the harmonic content of the output voltage signal. This paper presents the mathematical model and tested results of a new technique based on frequency modulation of the carrier signal modulation. The adjust of the frequency carrier follow a discontinuous function during each period of the fundamental term of the modulating wave to maintain the average value of the modulation to an integer value, and odd multiple of 3. The effects of this new technique, compared with classic, are to reduce the value of Total Harmonic Distortion (THD) and harmonic distortion, and increase the frequency of the first significant harmonic (LOH) as the same order of frequency modulation. By introducing a control parameter of the carrier signal, is able to change its electric spectrum to the inverter output. This feature makes it very suitable to prevent mechanical resonance frequencies when its engines used to power AC, or on the transformer that energizes the power network as photovoltaic or wind turbines.

## References

1. WENYI LIANG; JIANFENG WANG; WEIZHONG FANG. • Analytical Modeling of Sideband Current Harmonic Components in Induction Machine Drive With Voltage Source Inverter by an SVM Technique. Power Electronics, IEEE Transactions on Year: 2013, Volume: 28, Issue: 11.
2. XIANG WU; GUOJUN TAN; ZONGBIN YE; YI LIU; SHIZHOU XU. Optimized Common-Mode Voltage Reduction PWM for Three-Phase Voltage-Source Inverters . Power Electronics, IEEE Transactions on Year: 2016, Volume: 31, Issue: 4.