Modeling and Simulation of Electromagnetic Conducted Emissions from Buck Converter with Resistive Load

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Abstract—The paper deals with the modeling and simulation of conducted emissions from a buck converter switch mode power supply which operates at a switching frequency of 100 kHz. The design of a buck converter is also presented, its operation being afterward simulated. The corresponding waveforms demonstrate the proper operation. The switch control is performed with a 0.5% duty cycle PWM technique. The studied ideal switch is modeled using a MOSFET model. The study of conducted emissions produced by a buck converter considered a constant impedance and a frequency range 150 kHz - 30 MHz. To meet the measurements standards, the line impedance stabilization network is simulated and the results are compared with the CISPR 16-1-2 standard. The variations of the impedance over the 150 kHz – 30 MHz frequency range are plotted. The compatibility between the line impedance stabilization network (LISN) and the measurement standard CISPR 16-1-2 is evaluated. One also performs an analysis in the frequency domain of the measured noise signal produced by the buck converter. The results are presented both in RMS value and in dBμV and comparisons are made considering the Europeans standards. Finally, some methods of reducing the conducted emissions are suggested (e.g. the using of snubber circuit type, filtering etc).