

# Meeting Conducted Noise Standards

## Problem

Finding an efficient, compact solution to meeting EMI requirements is a greater challenge than ever. Here's how to meet the strict limits of FCC/VDE Class B using industry-standard high density components.

## Background

In the U.S. and Europe, conducted noise emissions are governed by the

Class A and Class B limits of both FCC and VDE standards. In the U.S., the FCC requires compliance with Class A for equipment operating in factory settings and Class B—the stricter standard—for equipment destined for home use. In Europe, all countries require that equipment for both home and factory use meet the VDE Class B standard.

The FCC and VDE standards are

familiar worldwide and the basis for many local standards. Meeting FCC/VDE Class B limits allows equipment to be operated in most settings anywhere.

“Conducted noise” refers to noise currents on the input power lines which are generated by high frequency switching circuits within equipment connected to the lines. These noise currents, which include common mode and normal mode noise, flow between the power source and the equipment power supply and find their way back onto the power lines. Common mode conducted noise current is the unidirectional (in phase) component in each of the two power lines, which generally finds a return path via the

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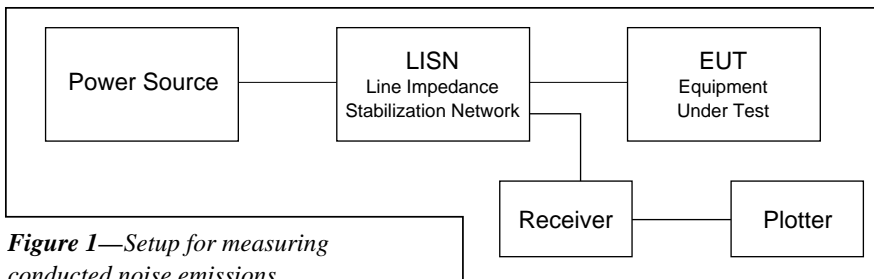
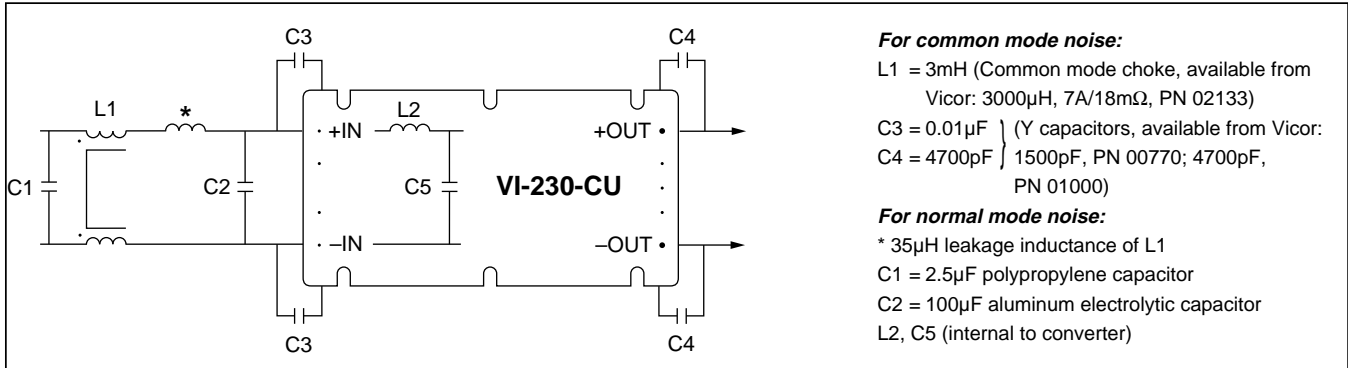
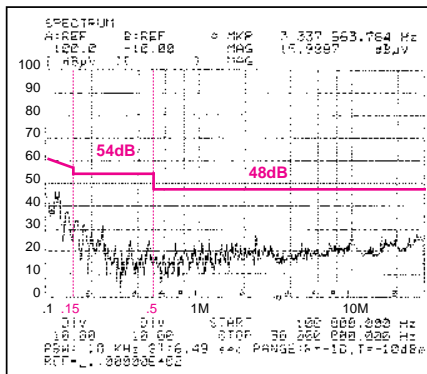


Figure 1—Setup for measuring conducted noise emissions.

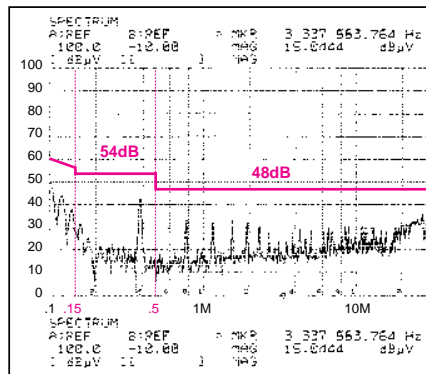


Above: Figure 2—A Model VI-230-CU Vicor converter (48VIN, 5VOUT, 40A) with the external circuitry to meet FCC/VDE Class B.

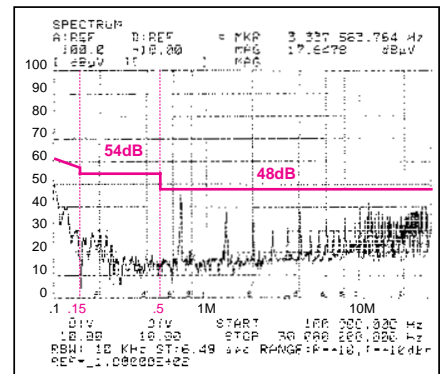
Below: Using the above configuration, the conducted noise at three load levels in relation to the standards' limits.



48VIN, 5VOUT, 3A



48VIN, 5VOUT, 15A



48VIN, 5VOUT, 40A

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third (earth ground) wire. Normal mode conducted noise current is the component of current which is opposite in direction or phase in the two power lines.

### **How to Measure**

Conducted noise measurements may be made using either a receiver or a spectrum analyzer in conjunction with related equipment to obtain sufficient sensitivity and overload protection to ensure accurate, repeatable measurements of all emissions over the frequency range of 100kHz to 30MHz.

Both the equipment under test (EUT) and the receiver or analyzer are connected to the power source through a line impedance stabilization network (LISN). See Figure 1. The LISN provides power line frequency (50-60Hz) coupling between the EUT and the power source, while ensuring a high degree of isolation over the spectral measurement range. The receiver or analyzer provides a 50 ohm termination to the LISN measurement port. This guarantees a fixed or calibrated relationship between conducted EMI current and the resulting voltage at the input of the measurement apparatus.

Figure 2 shows the solution to meeting the FCC/VDE Class B limits and widening your opportunities to market your products worldwide.

***For details, call Vicor at 800-735-6200 or your local Vicor representative or distributor.***