

# Notes on EMI and EMI Testing

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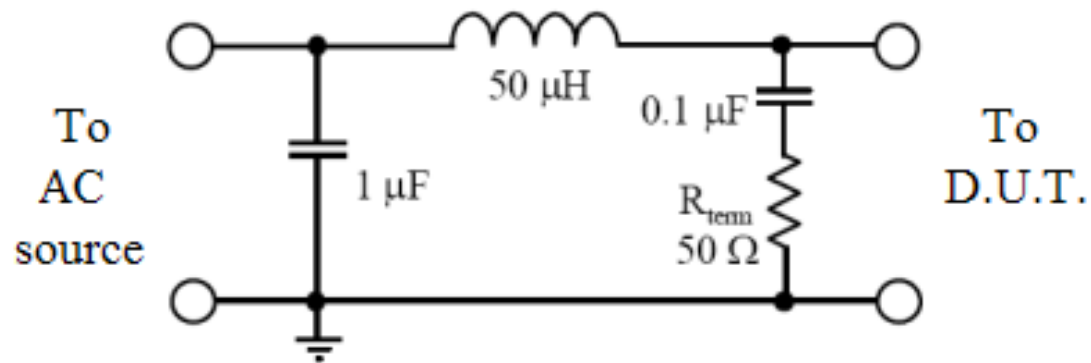
Worcester, MA 01609

# EMI

- Electromagnetic Interference
- Converters, rectifiers, etc. can add power line disturbances by injecting harmonic currents to the utility grid. This is conducted EMI.
- Fast switching currents can cause radiated noise. This is radiated EMI.

# LISN

- Line Impedance Stabilization Network
- Designed to present known impedance to device under test (D.U.T.)
- Used for measuring conducted EMI

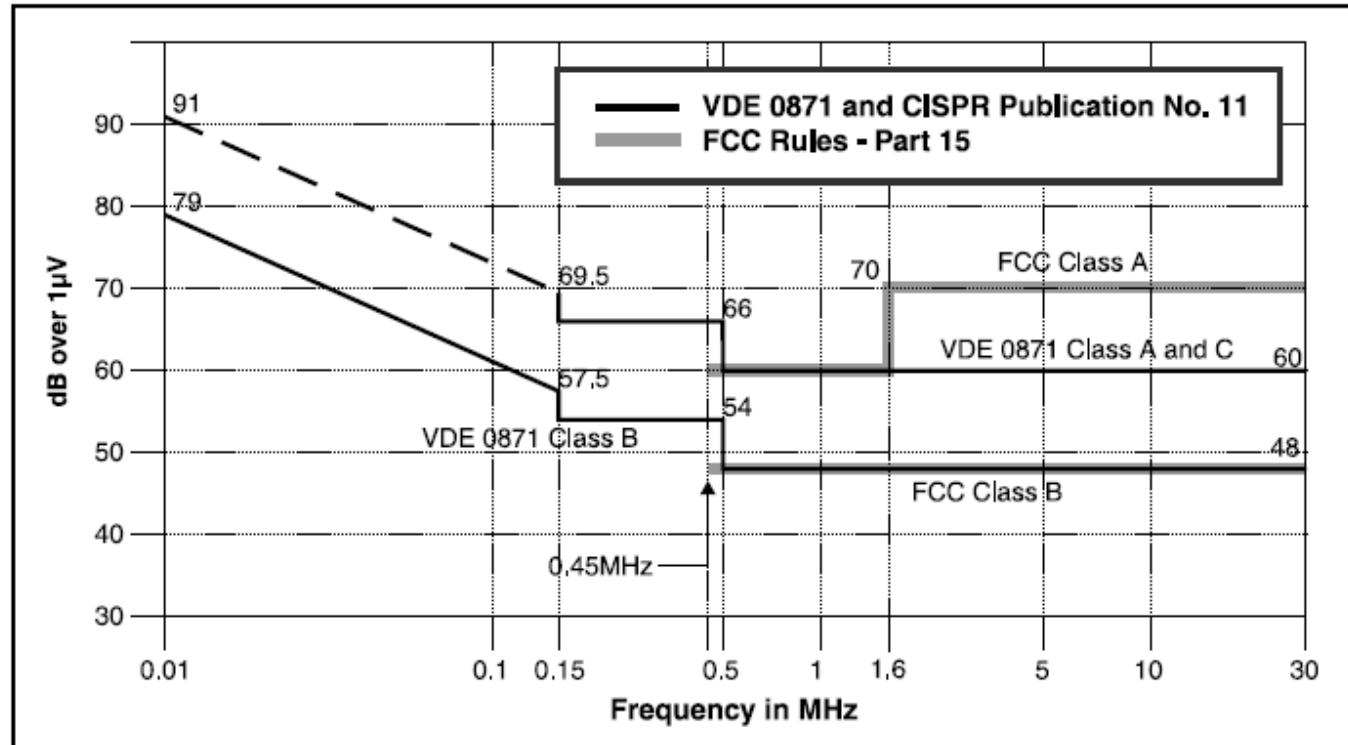


# Conducted EMI Limits

- There are FCC and VDE (European) standards
- One widely-used set of standards is Class A (industrial) and class B (home use)
- One set of limits is EN55011 and EN55022 which set conducted EMI limits in the 150 kHz to 30 MHz range

# Conducted EMI Limits

Fig. 11.1 -  
Conducted emission limits  
according to  
VDE 0871 and  
FCC-Rules  
Part 15



Reference: <http://www.astec.co.uk/pdf/catappnote/AppNote11.pdf>

# Radiated EMI Limits

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30 - 88	100
88 - 216	150
216-960	200
Above 960	500

Table 1

FCC Class B Radiated Emission Limits at 3 meters

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30 - 88	90
88 - 216	150
216-960	210
Above 960	300

Table 2

FCC Class A Radiated Emission Limits at 10 meters

Reference: D. A. Williams, "A Tutorial on EMI Characterization of Switching Regulators," *APEC '96*, March 3-7, 1996, pp. 333-339

# One Strategy

- In order to achieve compliance with EMI standards, both conducted and radiated specs must be met.
- One strategy is to first attack conducted EMI, since cause of much radiated EMI is inevitably harmonic currents in the power lines