

# The Virtual Conductor

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## Abstract

Of the many methods of analysing electromagnetic compatibility, circuit modelling is likely to be the most easily understood by designers of electronic equipment. Moreover, if circuit modelling is used to simulate electromagnetic coupling, then it becomes possible to demonstrate at bench test level that the proposed design meets the EMC requirements.

This paper shows how such an approach can be used to analyse the coupling between differential-mode and common-mode signals. Only three conductors are necessary to model such coupling. A triple T-network of LCR components can be used to represent the signal, return, and structure conductors.

If the inductors, capacitors, and resistors are transformed into a particular set of Z-parameters, then these new parameters can be used to simulate the effect of currents and voltages which vary along the length of the conductors.

The concept of the virtual conductor allows the L, C, and R properties of the local environment of a twin-conductor cable to be simulated. Coupling between aerial-mode and differential-mode signals can then be analysed over a range of frequencies which includes half-wave resonance.

Practical tests on the configuration-under-review allow component values to be assigned to the circuit, resulting in a definitive model. A set of such models can be used to assess the equipment against its EMC performance requirements. Details of the analysis are available at [www.designemc.info](http://www.designemc.info).