Lertsirimit, Chatrpol, “Electromagnetic Coupling to a Device on a Printed Circuit Board”

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An efficient hybrid method for calculating the electromagnetic coupling to a device on a printed circuit board (PCB) inside a cavity by a wire penetrating an aperture is presented. The hybrid method separates the printed circutit board analysis from the cavity analysis for numerical efficiency. The method allows a Thevenin equivalent circuit to be obtained at any point on the circuit board (a definable “port”), such as a point where a conductor trace meets a circuit component on the board. Hence the voltage level at the input to a device on the PCB that results from an exterior incident field can be calculated.

A transient electromagnetic pulse coupling into the syustem under inverstigation can have a significant impact on a digital device. The time-domian electromagnetic pulse coupling to the device can be calcuclated from the frequency-domain response using the Fourier transform. The system reponse in the frequency domain may be caculated by the hybrid method. The investigation in the time domain focuses on pulses comprising a sinsusoidal carrier wave modulated by an envelope function. A damped sinusoidal pusle is investigated in detail to explore how the output signal may be maximized.

In the frequency domain, the system response consists of many different types of resonant modes. The characterizing parameters of each mode are important in understanding the behaviour of the response and in aiding with the numerical calculations. A CAD fomrula for extracting these parameters is developed and presented here.