Voltage-Driven Enclosure Algorithm

Subroutine: *voltage_driven_enclosure*().

Purpose of Algorithm

Computes the radiation due to heatsinks that are driven against the board which is within a shielding enclosure.

Basic Description of Algorithm

Any metallic structures that are driven by components or traces can support common-mode currents and, in turn, create radiated emissions. Although this algorithm will ultimately be expanded to encompass a variety of metallic structures, it currently analyzes heatsinks.
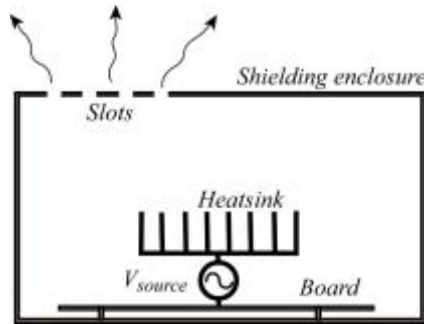

Fig. 1. Radiation due to the heatsink within a shielding enclosure

The magnitude of radiated field due to a heatsink in a shielded enclosure is calculated using the following equation.

$$E_{rad} = HF(V_{source}, component\_name, f, 1) \tag{1}$$

where *f* is the frequency of interest. For more information about the function *HF*, refer to "Enclosure Algorithm Summary" [1].

Assumptions

- The board is surrounded by a shielding enclosure.
- The slots are electrically small.
- The size of the heatsink is larger than $l/10$. The effects of the heatsink are neglected otherwise.
- The worst case is calculated (i.e. as if the enclosure resonates at all frequencies of interest).

Implementation Details

For each component at each frequency, the algorithm checks to see whether the component has a heatsink with a maximum dimension greater than one-tenth of a wavelength. If it does, the maximum value of the signal voltage on that component at that frequency, $V(f)$, is determined and the number of nets, N, that reach the maximum value is counted. The effective voltage of the noise source is determined using the following equation.

$$V_{source} = V(f) \times N \big/ (\text{numer of ground pins}) \qquad (2)$$

This value is passed to the high-frequency enclosure algorithm. Default values for the enclosure parameters are obtained from the personality file. The radiated electric field is calculated using Equation (1).

Reference
[1] Enclosure algorithm summary