An Impulse Electromagnetic Interference Shielding Based on a Diode Grid

Yangjun Zhang[1], Mengqing Yuan[2], Qing Huo Liu[3]*
[1]Dept. of Electronics & Informatics, Ryukoku University, Seta, Ohtsu 520-2194 JAPAN. zhang@rins.ryukoku.ac.jp
[2]Wave Computation Technologies, Inc., Durham, NC 27707, USA
[3]Dept. of Electrical and Computer Engineering, Duke University, Durham, NC 27708-0291, USA

It is necessary to protect electronic components and systems from the intentional or unintentional broadband impulse electromagnetic interference (EMI). The previously reported shielding permits the waves in the desired frequency band to be transparent, and stop the wave in the other frequency bands. This paper proposes a new impulse EMI shielding based on a diode grid. The proposed shielding is transparent to the electromagnetic wave when it is weak, but prevents the incident wave from transmitting when it is strong. The shielding permits the electronic systems to communicate with each other in a normal electromagnetic environment, but protects them from the intentional impulse EMI. The effectiveness of the shielding is evaluated using Wavenology^{TM}, a commercial full wave transient field simulator integrated with the nonlinear SPICE circuit solver. The paper also discusses the dependence of shielding on some important design factors such as the electromagnetic frequency and the size of the unit cell.

The diode used in the shielding is an RF Schottky Barrier diode. The SPICE parameters provided by the manufacture are: model HMPS282 D (IS=22000p RS=8.0 BV=15 IBV=0.1m CJO=0.7p M=0.5 N=1.08). Figure 1 indicates the simulated E field above and below the shielding when the incident field is a wave described by a broadband Black-Harris Window (BHW1) function.

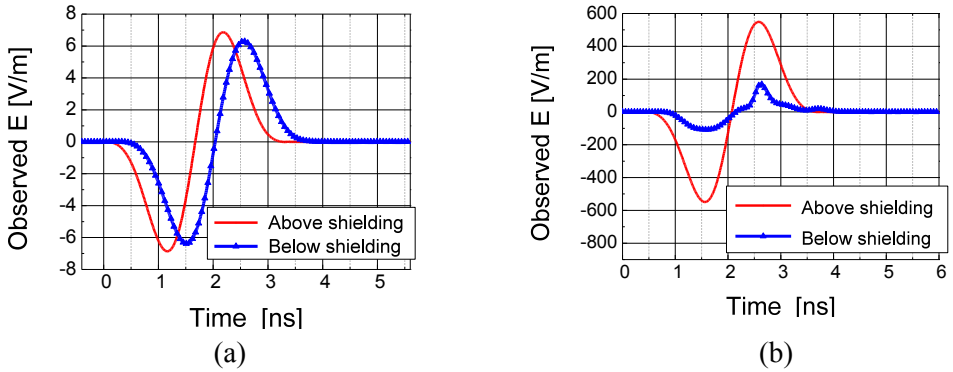

Fig. 1. Simulated *E* field above and below the shielding when the incident field is a wave described by a broadband BHW1 function (BHW1 frequency range, f_L to 100*f_L, f_L = 10MHz). (a) weak incident field; (b) strong incident field.