URSI GASS 2023, Sapporo, Japan, 19 – 26 August 2023

Super-resolution magnetic dipole moment from Near Field Scanning by Finite-Impulse-Response Filter

Jung-Ting Kao[(1)], Min-Hsu Tsai * [(1)], and Ruey-Beei Wu [(2)]
(1) National Taiwan University,Taipei,Taiwan; e-mail: r10942180@ntu.edu.tw

With the increasing complexity of electronic devices and advances in packaging technology in recent years, many circuits have to coexist in tiny spaces and the issue of electromagnetic interference (EMI) has recently become more important.Often, there are many unknown sources of radiation within the IC chip and in the IC package or printed circuit board (PCB) alignments, Commonly used methods can approach the noise source to Equivalent magnetic dipole moments [1].

In this paper applying the powerful localisation properties of the two-dimensional (2D) divergence magnetic field dispersion field, Fig. 1(a) 2D divergence magnetic field by Mx dipole, where the dipole moment is physically located at the positive centre of the 2D divergency magnetic field. The dipole moment is physically located at the positive centre of the 2D divergence magnetic field, the left pattern negative and right pattern is a good characteristics, Here designs the Finite Impulse Response (FIR) filter widely used for near-field measurement intervals is presented here, enabling the design of FIRs that satisfy the convolution equation:

$$f_{i,j} * g_{i,j} = M_{target-rect}. \quad (1)$$

Fig. 1(b) FIR filter in red region show the solution coefficient $g_{i,j}$ the upper and lower are symmetry,left and right are negative number, only a quarter of the is listed for display, Fig. (c) Through the impulse reconstructed by (1), the method in this paper can quickly located the magnetic dipole moment, compared to the traditional method, and here will also propose a calculation of the resolution of the restored dipole moment .In order to be more realistic.Finally, this paper is also applied to the actual package structure and chip for experimental verification to successfully locate the noise source Fig2. (a) and Fig2. (b).

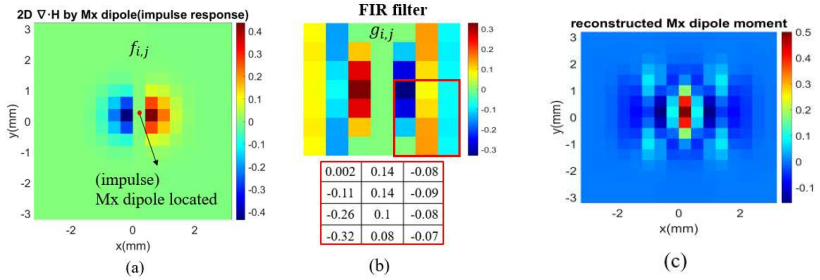

Figure 1. (a) 2D divergence fields peration by a unit $\widetilde{\boldsymbol{M}}_{\boldsymbol{x}}$ dipole (b) Example of design FIR coefficient (c) Reconstructed Mx dipole.

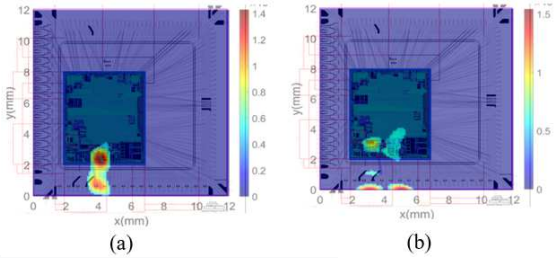

Figure 2. (a) FIR reconstruction dipole Mx location from IC. (b) Near-field measurement experiment to locate the My dipole.

References

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