

# Crosstalk Minimization in Three-Layer HVH Channel Routing \*

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## Abstract

*Crosstalk has become a major issue in VLSI design due to the high frequency, long interconnecting lines and small spacing between interconnects in today's integrated circuits. In this paper, we study the problem of crosstalk minimization in 3-layer HVH channel routing. A heuristic algorithm that combines layer reassignment and track reassignment is presented. This algorithm can iteratively modify the layout so that the crosstalk in the channel is minimized. Experimental results show that the proposed approach can reduce the crosstalk by an average of 16.4% on a set of benchmark examples.*

## 1: Introduction

Due to the scaling down of device geometry in deep-submicron technologies, the crosstalk noise between adjacent nets has become a major concern in high performance VLSI circuit design. Increased coupling noise can cause signal delays, logic hazards and even malfunctioning of circuits [1, 6], and thus controlling the level of crosstalk noise in a chip has become an important task for IC designers.

In this paper we study the problem of crosstalk minimization in 3-layer HVH channel routing. This routing style allows using two horizontal layers (layer 1 and layer 3) and one vertical layer (layer 2) for routing. Another popular 3-layer routing style is VHV where two vertical layers and one horizontal layer are available. Both routing styles can be found in various designs, but HVH routing can usually achieve a smaller routing area than VHV routing. Though there are several reports on crosstalk minimization in 2-layer channel routing [4, 5], only a very limited number of papers have been published on crosstalk minimization in 3-layer routing. In [7], Thakur et. formulated the layer reassignment problem in 3-layer VHV routing as a longest path problem. This formulation, however, is invalid for HVH routing. In [2], we proposed a layer reassignment algorithm for antenna effect minimization in 3-layer HVH routing, and this algorithm can be modified to minimize crosstalk as well. But we found that the quality of the solution achieved by this method is usually unsatisfactory. Another approach that has been used for crosstalk minimization in 2-layer channel routing is track permutation [4], which can also be modified and used in reducing crosstalk noise in 3-layer HVH routings. However, this approach has its limitations too [8].

In this paper, we present an algorithm that combines layer reassignment and track reassignment techniques. This algorithm can iteratively modify the layout so that the crosstalk in the channel can be minimized.

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