


國立交通大學
電信工程研究所
碩士論文

應用於無線網路之印刷式可切換場型與
波束天線之研究



Radiation Pattern Reconfigurable
Strip Monopole Antenna with
Switched Printed Parasitic
Elements

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摘要

在本論文中，一種新型的智慧型天線(可切換場型及波束天線)被提出。這種新型天線主要架構為八木天線並經過適度改良。一般傳統八木天線的現行天線架構被平面式印刷電路取代而免除了複雜的立體製作過程。寄生元件也使用電路切換直接改變其有效長度以發揮反射器(reflector)與導引器(director)的功能。藉由這些功能性的寄生元件便可以達到場型可變的效果。本論文中一共提出三個天線模組，以分別討論其改良式八木天線結構中的種種參數影響。從最簡易的三元件天線陣列到五元件天線陣列，並於最後提出以十字型排列的九元件陣列。十字型排列的九元件陣列不但可提供四種不同的模態分別的指向性，其中每一種更可以藉由不同組合的電路開關切換使得主波束有九十度的旋轉可能。如此一來便可以提供十六種不同的場型以配合實際應用所需。且各模態不僅可以互相獨立操作對準目標訊號用以強化接收品質，還可以藉由模態間相互的切換產生具互補性且高增益的全向性輻射場型，因此利用切換波束的設計方式比傳統利用分集式產生互補式輻射場型的設計方式更具優勢。其中，在某些需要高增益的應用時，此天線陣列可以有7.59 dBi 的高增益以資利用。

Radiation pattern reconfigurable strip monopole antenna with switched printed parasitic elements

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Abstract

A configuration of radiation pattern reconfigurable antennas is proposed in this work. The configuration is based on Yagi-Uda antenna and has been modified. In this paper, cylindrical monopoles are replaced by printed strip monopoles on the dielectric substrate, and the effective length of the printed parasitic monopole element is varied directly by switches, with which results in the radiation pattern reconfigurable. Three simple example antennas are presented, that is, a three elements array, a five elements array, and a nine elements array (shaped as a crisscross), and some experiments are validated. The measured results show that a maximum peak gain of 7.59 dBi is achieved by the nine elements array. The nine elements array provides multiple directivities and each directive pattern can be rotated by 90 degrees with different cases of switches states. The properties of antennas proposed in this paper are low cost, flexible design, easy-fabrication, and high gain.

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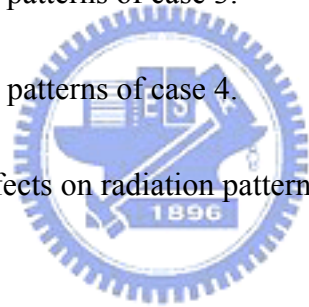
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