# A Planar Shaped-Beam Antenna using Leaky-Wave Characteristics

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## ABSTRACT

In this thesis, the shaped-beam antennas were investigated systematically using theoretical analysis and experimental measurement. The basic structure of the shaped-beam antenna contains a line source, taken as an excitation source, embedded in an air substrate sandwiched between a metal reflector and a grating made of metallic or dielectric material. Due to the contribution of leaky wave caused by the grating and direct wave radiating directly from the line source, such a shaped-beam antenna can radiate uniform electromagnetic field pattern over a rectangular plane in front of the antenna. In addition to the fabrication and measurement for the radiation characteristics of this antenna, the rigorous mode-matching method was employed to study the electromagnetic fields within the structure and the radiation far-field pattern, as well. Furthermore, the sensitivity analysis for the parameters including the geometric structure and electrical property of the dielectric material was taken into account to understand the tolerance of this antenna during fabrication. Since this antenna can radiate uniform coverage over a rectangle footprint, it can be a good candidate for serving as the antenna of a hyper LAN (local area network) access point in millimeter wave applications.

# 利用漏波特性之平面波束整形天線

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## 摘要

本論文旨在有系統地利用理論分析與實驗量測探討波束整形天線。波束整形天線基本架構包含一線電流激發源置於金屬反射面與由介電材料或金屬所組成的週期結構間，由於週期結構所引發的漏波與線電流源直接輻射所合成之電磁場，具有可輻射均勻電磁場於矩形平面之特性。除了實作與量測天線特性外，亦用嚴謹波模匹配法研究天線結構中電磁場與遠場輻射場形分布。此外我們對天線結構參數與介電質材料電性做參數化分析以了解天線於製作過程中的容忍度。本天線可輻射均勻電場覆蓋於一矩形平面，因此可提供在毫米波區域網路（hyper LAN）存取點天線應用中除了碟形天線之外的另一個選擇。