Available online at www.sciencedirect.com

ScienceDirect

Procedia Manufacturing 22 (2018) 527–532

Procedia MANUFACTURING

www.elsevier.com/locate/procedia

11th International Conference Interdisciplinarity in Engineering, INTER-ENG 2017, 5-6 October 2017, Tirgu-Mures, Romania

Planar leaky-wave antenna at 6GHz

Hicham Aziz[a,]*, Mahmoud Moubadir[a], Naima Amar Touhami[a], Abdelkrim Farkhsi[a]

[a]*University Abdelmalik Essaadi, Faculty of Science BP. 2121 M'HannechII , 93030Tetuan, Morocco*

Abstract

This paper presents a leaky-wave antenna, which operates at the frequency of 6 GHz. The proposed structure bases on a series of resonant patch antennas, which is connected by micro strip lines to have an antenna array by using the same element. The simulation gives good results, (the reflection, coefficient, gain and the isolation).

Peer-review under responsibility of the scientific committee of the 11th International Conference Interdisciplinarity in Engineering.

Keywords: Antenna Array; Leaky waveguide; Array; Patch; Microstrip; Rectangular Patch.

1. Introduction

Leaky-Wave Antenna (LWA) as it is known, belongs to the more general class of traveling wave antenna. That last one uses a travelling wave on a guiding structure exactly as the main radiating mechanism [1,2,3,4,5,6]. This is why we can say that it is basically a wave guiding structure that possesses a mechanism to permit to leak power all along its length.

Furthermore, leaky-wave antennas have been known and used for more than 40 years [7,8,9,10]. Almost all, the early antennas were based on closed waveguides that were made leaky by cutting along the side of the waveguide in order to allow the power to leak away along the length of the waveguide. The latest millimeter-wave waveguides are actually already open, in order to reduce the attenuation constants of this kind of waveguides as a result of metal or dielectric losses. Examples are various, dielectric waveguide, groove guide, NRD guide microstrip line, etc[11].

* Corresponding author. Tel.: +212-665-711-261.
E-mail address: aziz.hich1am@gmail.com

2351-9789
Peer-review under responsibility of the scientific committee of the 11th International Conference Interdisciplinarity in Engineering.
10.1016/j.promfg.2018.03.077

Of course, some of these guides are lossless than others. The dominant modes on these open waveguides are generally purely bound, but a physical cut will not make them leak. In other terms, some new techniques are necessary, such as the introduction of asymmetry or some other modification of the geometry.

Let us talk about some important types of leaky-wave antennas LWA, *Uniform* and *Periodic* ones particularly[12,13,14]. These two types are actually similar in principle to each other, but their performance properties are different in several ways, and they face somewhat different problems in their design.

The first type, the uniform leaky-wave antenna, is uniform along the length of the guiding structure, as opposed to possessing some periodic modulation. (In order to improve and control the side lobe level, we recognize that the uniform leaky-wave antenna has a small taper along its length.).

The second type, is about a periodic leaky-wave antenna, which is charged to produce the leakage. The periodic modulation itself is uniform along the structure's length, again except for the small taper of the periodic properties along the length to control the side lobes. Furthermore, a complex propagation wave number results, with β and α; large or small values ofα are related to the beam width and the radiation efficiency in the same way as that found for uniform leaky-wave antennas.

To sum up, we mention that a wide variety of possible traveling-wave periodic array antennas can be achieved by employing micro strip line. For example, you can employ series of resonant patch antennas, which are connected by the micro strip line Fig.1.a, or series of array elements coupled by proximity to the micro strip line Fig.1.b[3]. In fact, there is no theory available for the majority of these antennas. But there are few structures, such as the one shown in Fig.1.a ; the theory type is used to describe the behaviour of slot arrays.

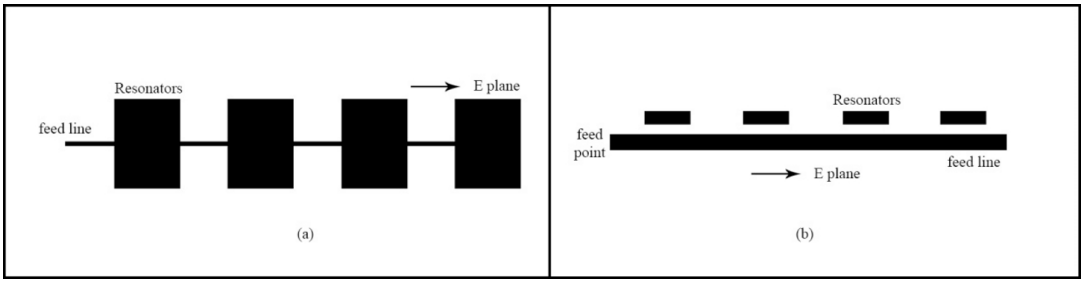

Fig. 1. (a) Series of resonant patch antennas connected by microstrip line; (b) Series of elementary radiators, resonant or not, coupled by proximity to the microstrip line.

Nomenclature

CST	Microwave Studio.
LWA	Leaky-Wave Antenna.
NRD	Non-Radiative Dielectric waveguide.

2. Structure equivalent of leaky-wave antenna

The proposed micro strippatches antenna, which is shownin Figure2. Furthermore, the improved adaptation, two slots,are introduced on the patch.

In thisdesign, the substrate is FR-4(1.5mmheight), and the dielectric constant is 4.3. Moreover,the loss tangent is 0.025, and the dimensions of ourantenna are optimized by using CST Studio Suite.

Furthermore, we connected our patch by a micro strip line and the periodic element as shown in the Fig. 2. In order to miniaturize the space, we used the cross instead the micro strip line as shown in the Fig. 2b.