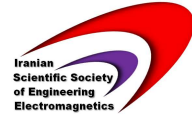


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and Characterization of Devices and
Subsystems

The Second Iranian Conference on
Engineering Electromagnetics
(ICEEM 2014),
Jan. 8-9, 2014



Radiation of Modulated Ultra wide band (UWB) Signals by Switched Resonant Patch Antenna

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ABSTRACT— Design of planar antennas which provide large impedance bandwidth and also large radiation bandwidth is a challenge in UWB systems. Although ultra wide impedance bandwidth is readily achievable, radiation pattern rotation and phase centre variations are unavoidable characteristics of conventional passive antennas. Introducing an active element in the antenna structure and using its nonlinearity may overcome these limitations. In this paper, we use some diode switches integrated with a microstrip patch antenna. A modulating signal controls the switches states and a Direct Antenna Modulation (DAM) is established. The results show that the switched antenna radiates modulated signals with stable radiation pattern and constant phase center over a 1GHz bandwidth.

KEYWORDS: diode switch, direct antenna modulation, patch antenna, Ultra wide band (UWB).

I. INTRODUCTION

In spite of the fast movements observed in the area of ultra wideband (UWB) systems, design of an antenna capable of the all needed requirements in these systems is still under research [1].

For instance, conventional UWB antennas such as spiral and Vivaldi have a relatively constant radiation pattern but they are rather

bulky and also have variable phase centre. In recent years, multi-resonance planar monopole antennas have been proposed as a low cost and low profile candidate for UWB applications which provide a large impedance bandwidth [2]. However, they suffer from radiation pattern rotation which corresponds to different resonant modes. In contrast, microstrip patch antenna as single resonant radiator has never been proposed as a UWB antenna due to their narrow impedance bandwidth.

In this paper, feasibility of UWB radiation by a microstrip patch antenna is studied. To overcome the effects of limited bandwidth on the radiation, the idea of direct antenna modulation (DAM) [3]-[5] is applied. This method focuses on nonlinear transient behavior of the antenna instead of its linear frequency response [3] and directly modulates the output of antenna. Thus high speed switches like diode are integrated on the radiation slots of the antenna to control its transient radiation. When antenna is excited in its RF resonance frequency, by controlling the diode with an additional source, radiation slots are opened and shorted periodically according to diode condition. When diodes are on, slots are shorted and accumulated charges on the patch go to the ground, so the antenna operates in cavity mode and RF energy is stored. On the other hand, when diodes are off, RF energy