

SOURCE: Institut für Hochfrequenztechnik und Elektronik (IHE),  
Karlsruhe Institute of Technology (KIT)

## **A miniaturized pattern reconfigurable antenna for automotive applications**

Abstract—This paper presents a realization approach of a pattern reconfigurable antenna. Based on the results of the previous research using wave propagation simulation, the radiation patterns optimized for automotive urban scenarios are chosen. The patterns are determined by a special antenna synthesis method. The antenna in this work generates two switchable patterns obtained from this synthesis. The first one is in and against the driving direction and the second is directed orthogonal to the driving direction to the left and right hand sides of the vehicle. The pattern switching is realized by switching the phase between the parallel fed radiating elements. An easy method of phase switching with means of a tapered line balun and p-i-n diodes is proposed. The antenna covers the 2.45GHz ISM band, and therefore can be easily used for measurements in an unlicensed band. As a proof of concept a prototype of the antenna utilizing p-i-n diodes as switching elements has been fabricated and measured. The maximal gain achieved is about 6.5 dBi. The measurement results correspond well with the simulation results in terms of S-parameter and radiation.

Jerzy Kowalewski ; Tobias Mahler ; Jonathan Mayer ; Thomas Zwick  
IHE/KIT  
Facoltà di Ingegneria  
Kaiserstrasse 12,  
76131 Karlsruhe, Germany  
Phone: +49 721 608 45429  
Fax: +49 721 608 45027  
Email: jerzy.kowalewski@kit.edu