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Accurate Remote Vital Sign Monitoring with 10GHz Ultra-wide Patch Antenna Array

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Abstract: A patch antenna array has been presented at 10GHz frequency with improved gain (14dBi) and far-field radiation capabilities for accurate detection of human respiration and heart beat rate with Doppler radar technique. The measured and simulation antennas' results showed good agreement. Feasibility of 10GHz channel has been studied for remote vital sign monitoring (RVSM) under Doppler radar theory. Both the breathing rate (BR) and heart rate (HR) of a man have been accurately detected from various distances ranging from 5cm to 4m with as small transmitted power as -10dBm .

Keywords: Patch antenna array, Doppler radar, remote vital sign monitoring, Doppler radar theory, 10GHz microstrip antenna

1. Introduction

Remote monitoring of respiration and heart beat rate with Doppler radar is a more convenient way to check the vitality signs of a person as compared to the conventional vital sign monitoring devices which need direct sensors plantation on the subject body [1-5]. RVSM finds its applications in regular and special health care, emergency services, security and defence sectors [1-10].

RVSM with Doppler radar at low power ultra-wide band frequencies (UWB) (3.1GHz-10.6GHz) has become quite popular due to several reasons like low electromagnetic (EM) interference, high EM wave penetration, low power consumption, etc. [11-18]. For such UWB RVSM systems, appropriate antenna design plays a crucial role in both the precision of

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