Abstracts

Modulation Schemes in Low-Cost Microwave Field Sensors

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The use of modulation schemes in short-range microwave field sensors are discussed and in particular the ideas are applied to low-cost self-detecting doppler sensors based on a two-terminal negative resistance diode oscillator which acts as a load variation detector. FM-CW and pulse modulation techniques are described which can lead to improved performance in these sensors, and experimental results of bias modulation, varactor modulation, and pulsed operation of transferred-electron oscillators are presented. Modulation techniques can be applied in order to eliminate false alarms due to unwanted targets by enabling the doppler sensor to measure or discriminate target range, and the potential merits of different schemes based on frequency modulation with linear and sinusoidal modulation patterns are explored. A novel environmental profiling technique is proposed which exploits the response of frequency-modulated sensors to multiple stationary targets for use in a versatile short-range surveillance system employing digital processing techniques. The mechanism of pulsed operation in self-detecting sensors is described, and the effects of temperature variations in the active device, which result in frequency chirp, are considered. The technique of extracting the doppler signal from the pulsed bias current using a pulse cancellation circuit is demonstrated, and the effects of bias current changes during the pulse (due to temperature variations) on the use of this type of circuit are discussed.

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