A Novel Electric-field Sensor for Projectile Detection

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***Abstract*— The development of a novel and inexpensive sensor, for detecting the electrostatic field (ESF) of a charged bullet, was explored in this paper. The principle method used to measure the ESF of the passing object was based on a voltage-controlled variable capacitance. This method utilized a varactor pair and sinusoidal input signal to produce a significant change in voltage proportional to the minute change in capacitance caused by the passing objects ESF. The focus of the paper is the development of the sensor based on known pulses from a charged bullet [1].**

I. Introduction

Currently used sensor systems for the bullet detection and direction assessment rely mostly on acoustical methods [2]. The muzzle blast and the ballistic shockwave are being detected by an array of sensitive microphones, and then after the signals are processed, the location of the shot source can be determined. Depending on the algorithms that are being used the method can be computationally heavy and the sound wave is distorted by the terrain configuration, leading to miscalculations. Along with the microphone arrays other types of sensors are frequently used to increase reliability and accuracy of the system. One of the proposed configurations [3] describes use of the infrared (IR) detectors. The muzzle flash can be detected with IR sensors out to a kilometer or more, but the sensors must have clear line of sight to the weapon, and the flash can be suppressed. A good overview of existing methods can be found in the paper by Scanlon [1]. In this paper a new approach is proposed, after