

Effective Coverage Area Enhancement of a Solar Powered Ultrasound Pest Control Device through Ultrasound Booster System Design

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A solar powered ultrasound pest control system comprising of the standalone device and a booster unit was designed, implemented and their performance evaluated both in laboratories and in farms. The concern of this work is to further enhance the coverage area of the device through an effective booster system design, explore better configuration options which can be applied in large farm type, formulate the mathematical expressions relating the area of ultrasound coverage on a farm to the number of booster units required and the associated power analysis indicating the solar panel and battery requirement when such configurations are implemented. Result and analysis of the designed and constructed booster system reveals that it enhanced the effective coverage area of the standalone device by a factor of five and nine when in isolated and contact placement methods of booster configuration respectively.

1. Introduction

An ultrasound pest control booster is a device that is used to improve the signal strength of an electronically generated ultrasound for the purpose of pest control [1]. Ultrasound refers to high intensity sound beyond 20 kHz [2] and [3]. At determined frequencies (25 and 35 kHz), though being inaudible to humans [4], has a scary effect on weaver birds. In a previous work [5], an ultrasound booster, simply referred to as the booster box was designed, implemented and tested. In the design concept, raw ultrasonic signal was transferred from an ultrasound generator to a remote station, here referred to as booster location where it is processed and transmitted within the locations with a 360° horizontal spread and a bottom boost. The five-segment concept and the nature of transducer orientation used keeps the entire booster location and the standalone location saturated with ultrasound while in operation. Furthermore, the design economics of having an ultrasound booster rather than replication of standalone device gives credence to the low-cost design concept. The focus of this research is on further enhancing the ultrasound

coverage area by increasing the number of booster units, improve on the gains of the ultrasound booster so designed by expanding its design concept and to make appropriate modification on the standalone device to accommodate the expansion made.

The significance of this study is that by this work, more area of land will be covered and the pest deterrent property of ultrasound shall be extended to more crops as they are brought under its protective cover.

2. Review of previous efforts

2.1 Design description

In this work, the entire ultrasound pest control system consists of two sub devices namely: the standalone unit and the booster unit. Each unit is made up of the device itself and other supporting parts working together to achieve same objective. The schematic diagram adopted to depict the design connection between the standalone unit and its booster unit is shown in Figure 1.

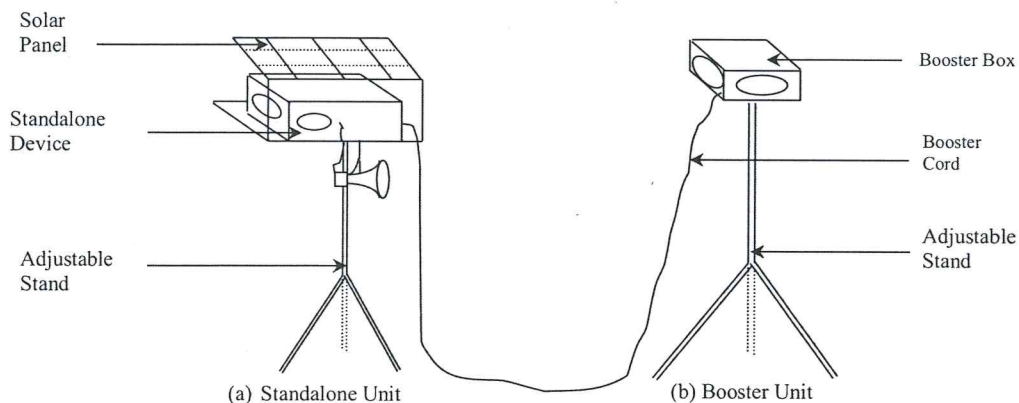


Figure 1: Schematics of the Ultrasound Booster System [6]