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Booster Mode Analysis for a Designed Ultrasound Pest Control Booster System

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ABSTRACT
An ultrasound pest control booster system to enhance the area of coverage of a stand-alone ultrasound weaver bird pest control device was previously designed and implemented. The concern of this study is to work out how this system of devices can be adapted in large farm types in terms of the booster units that may be required and in some cases, the rounds of boost that may be required. Mathematically based arguments were used in this analysis with result showing that the expression relating the area of ultrasound coverage on a farm to the number of booster units required when the booster system is in isolated placement and contact placement method is given by $A_{BI} = (n+1)A_S$ and $A_{BC} = (2n+1)^2 A_S$ respectively.

Keywords: *Ultrasound, ultrasound booster system, stand-alone unit, ultrasound booster unit, pest, weaver birds.*

1 INTRODUCTION

In a previous work, the concept of ultrasound pest control signal boosting was brought to the fore as a way of enhancing the effective coverage area of a stand-alone ultrasound pest control device (Ibrahim *et al.*, 2013a, Ibrahim *et al.*, 2014). 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 (Ibrahim, 2015). The booster system as designed and implemented consists of a stand-alone unit working in synergy with the booster unit. The stand-alone unit is made up of the stand-alone device, adjustable stand and the solar panel while the booster unit consists of the booster box, adjustable stand and the booster cord as depicted by Figure 1.

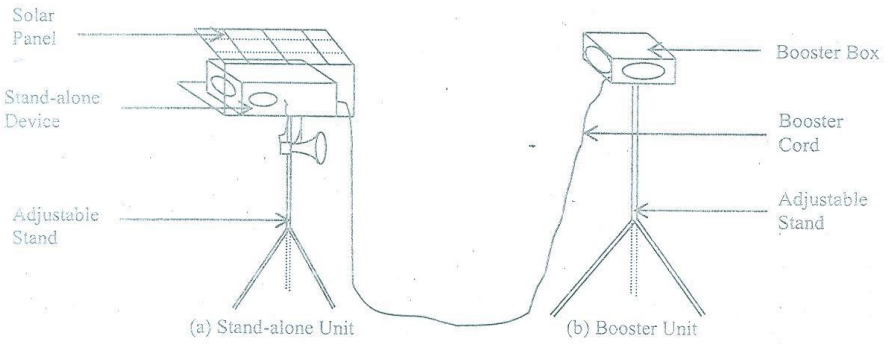

Figure 1: Schematics of the Ultrasound Booster System

The stand-alone device generates the power as well as ultrasound signal requirements and also transmits ultrasound signal in five directions (Ibrahim *et al.*, 2017). While the booster unit receives electrical power and a portion of the raw ultrasound signal generated by the stands-alone device, processes it using sets of designed amplifiers and transmit same in five directions using ultrasonic transducers (Ibrahim *et al.*, 2016). Making the stand-alone unit the power house as well as the ultrasound signal generator of the booster system while the booster unit is the ultrasound signal booster of the system. The design concept was such that a maximum of four booster units were employed and they shall all take delivery of raw ultrasound from the stand-alone device through the booster cords to their respective booster locations where they are processed and transmitted in five directions. A study to evaluate the performance of the system shows that ultrasound from the units was sensed up to a distance of 35 meters, became faint on further probing and faded away beyond forty meters (Seriki, 2015). Therefore, 35 m was considered as the effective distance around each unit. For the system to be operated, two placement methods can be employed: The isolated placement and the contact