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**Sudan University of Science and Technology**

**College of Engineering**

**School of Electronics Engineering**



## **Simulation RADAR JAMMER**

A Research Submitted in Partial fulfillment for the Requirements  
of the Degree of B.Sc. (Honors) in Electronics Engineering  
(communications)

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**September, 2014**

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## الإستهلال

قال تعالى :



{ فَتَعَالَى اللَّهُ الْمَلِكُ  
وَلَا تَعْجَلْ بِالْقُرْآنِ مِنْ قَبْلِ أَنْ  
يُقْضَىٰ إِلَيْكَ وَحْيُهُ وَقُلْ رَبِّ زِدْنِي  
عِلْمًا } صدق الله العظيم

سورة طه الآية {114}

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## Dedication

We dedicate this project to our fathers and mothers, who sacrificed gracefully for helped and supported us until we reach this stage.

Also we dedicate this project to our family and our friends who supported and stood beside us.

Our love and gratitude to them.

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## **Acknowledgement**

Our thanks are due to Sudan University of Science and Technology and to the College of Engineering. Spatially the Department of Communication and the School of Electronic Engineering.

Our sincere gratitude to Dr. Rashid Abdelhaleem Saeed who supervised this project whose advice was very helpful and important. And has made every effort in order to reach this stage. Our thanks also to our colleague Safwat Magdi Safwat for his generous help.

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## Abstract

Proportion to the presence of a large number of attackers radar targeting certain sites over the past years has become there considerable need a clear strengthening of the Department of military radar and improved algorithms and interference mitigation techniques jamming, jamming by using radar to protect the place of destination of the attackers radar, because the enemy has a frequency hopping in the radar does change frequency constantly that disappears, to resolve this issue before disclosing use new circuit diagram for jamming transmitters to jam the attacker's radar and communication.

The transmitter generates the RF signal which modulated with pulse signal and propagated into the target which reflects the RF signal into the receiver to receive it. If the receiver received the signal with noise and jamming the microcontroller detected it, which the microcontroller convert from digital output to analog voltage frequency. The microcontroller sent the analog voltage signal to transmitter which change frequency to be jamming.

## المستخلص

نسبة لوجود عدد كبير من الرادارات المهاجمة التي تستهدف مواقع معينة على مدى السنوات الماضية، هناك حوجة كبيرة لتعزيز قسم الرادارات العسكرية وتحسين تقنيات التداخل لتخفيف التشويش. التشويش باستخدام الرادار يقوم بحماية مواقع معينة من جهة الرادارات المهاجمة، لأن العدو لديه تردد التنقل في الرادار لتغيير التردد باستمرار إلى أن يختفي، لحل هذه المشكلة تم استخدام مخطط الرسم البياني لتشويش الإشارة المرسله لكي تشوش على الرادار المهاجم.

المرسل يولد إشارة الترددات اللاسلكية التي تتضمن مع نبضات الإشارة ونشرها إلى الهدف الذي يعكس إشارة الترددات اللاسلكية إلى جهاز الإستقبال لاستقبالها. إذا استلم جهاز الاستقبال الإشارة المرسله مع الضوضاء والتشويش يقوم المتحكم بالكشف عن ذلك، و الذي يحول الإشارة الرقمية إلى تماثلية. المتحكم يرسل الإشارة التماثلية إلى جهاز الارسل الذي يقوم بتغيير التردد إلى أن يتم التشويش.

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## **LIST OF ABBREVIATIONS**

AC	Analog Current
ADC	Analog to Digital Convertor
AVR	Automatic Voltage Regulator
CMOS	Complementary Metal Oxide Semiconductor
CW	Continuous Wave Radar
DAC	Digital to Analog Convertor
DC	Digital Current
DIP	Dual Inline Packaged
ESM	Electronic warfare Support Measure
EEPROM	Electrically Erasable Programmable Read Only Memory
IC	Integrated Circuit
IR	Infra-Red
LCD	Liquid Crystal Display
LPF	Low Pass Filter
Op-Amp	Operational Amplifier
OTP ROM	One Time Programmable Read Only Memory
PSR	Primary Surveillance Radar
RAM	Random Access Memory

RC	Resistor capacitor
RF	Radio Frequency
RGPO	Range Gate Pull Off
RIC	Resistor Inductor Capacitor
RISC	Reduced Instruction Set Computer
SRAM	Static Random Access Memory
SSR	Secondary Surveillance Radar
Transponder	Transmitting responder
USART	Universal Synchronous/Asynchronous Receiver/Transmitter

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## LIST OF SYMBOLS

$C$	- Capacitor
$F$	- Frequency
$R$	- Resistor
$R_T$	- Total resistance
$V_c$	- Voltage across capacitor
$V_R$	- Voltage across resistor
$V_{in}$	- Input voltage
$V_{out}$	- Output voltage
$X_c$	- Capacitive reactance



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# **CHAPTER ONE**

## **INTRODUCTION**

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## **1.1. Preface:**

Radar is an electromagnetic system for the detection and location of objects. It operates by transmitting a particular type of waveform, a pulse-modulated sine wave for example, and detects the nature of the echo signal. Radar is used to extend the capability of one's senses for observing the environment, especially the sense of vision. The value of radar lies not in being a substitute for the eye, but in doing what the eye cannot do-Radar cannot resolve detail as well as the eye, nor is it capable of recognizing the "color" of objects to the degree of sophistication of which the eye is capable. However, radar can be designed to see through those conditions impervious to normal human vision, such as darkness, haze, fog, rain, and snow. In addition, radar has the advantage of being able to measure the distance or range to the object. This is probably its most important attribute[1].

The name radar reflects the emphasis placed by the early experimenters on a device to detect the presence of a target and measure its range. Radar is a contraction of the words radio detection and ranging. It was first developed as a detection device to warn of the approach of hostile aircraft and for directing antiaircraft weapons. Although a well-designed modern radar can usually extract more information from the target signal than merely range, the measurement of range is still one of radar's most important functions. There seem to be no other competitive techniques which can measure range as well or as rapidly as can radar.

## **1.2 Problem Statement:**

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Jamming by using radar is used to protect the intended place from attacker's radar. The enemy has a frequency hopping in their radar to change the frequency continuously to be disappeared.

For the last few years, there are clear needs to enhance the military radar section and improve the jamming mitigation techniques.

### **1.3 Proposed Solutions:**

The proportion of the large number of attacker's missile targeting a specific location, in order to solve this frequency to voltage is done to detect if there is interference. This project presents a new circuit diagram for jamming transmitters to jam the attacker's radar and communication.

### **1.4 Literature Review:**

The word "radar" was originally an acronym, RADAR, for "radio detection and ranging". Today, the technology is so common that the word has become a standard English noun. Many people have direct personal experience with radar in such applications as measuring fastball speeds or, often to their regret, traffic control.

The history of radar extends to the early days of modern electromagnetic theory. In 1886, Hertz demonstrated reflection of radio waves, and in 1900 Tesla described a concept for electromagnetic detection and velocity measurement in an interview. In 1903 and 1904, the German Engineer Hulsmeyer experimented with ship detection by radio wave reflection, an idea advocated again by Marconi in 1922. In that same year, Taylor and Young of the U.S. Naval Research Laboratory (NRL) demonstrated ship detection by

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radar, and in 1930 Hyland, also of NRL, first detected aircraft (albeit accidentally) by radar, setting off a more substantial investigation that led to a U.S. patent for what would now be called a *continuous wave* (CW) radar In 1934.

The development of radar accelerated and spread in the middle and late 1930s, with largely independent developments in the United States, Britain, France, Germany, Russia, Italy, and Japan. In the United States, R. M. Page of NRL began an effort to develop pulsed radar in 1934, with the first successful demonstrations in 1936. The year 1936 also saw the U.S. Army Signal Corps begin active radar work, leading in 1938 to its first operational system, the SCR-268 antiaircraft fire control system and in 1939 to the SCR-270 early warning system, the detections of which were tragically ignored at Pearl Harbor. British development, spurred by the threat of war, began in earnest with work by Watson-Watt in 1935. The British demonstrated pulsed radar that year, and by 1938 established the famous Chain Home surveillance radar network that remained active until the end of World War II.

The electronic principle on which radar operates is very similar to the principle of sound-wave reflection. If you shout in the direction of a sound-reflecting object (like a rocky canyon or wave), you will hear an echo. If you know the speed of sound in air, you can then estimate the distance and general direction of the object. The time required for an echo to return can be roughly converted to distance if the speed of sound is known.

Radar uses electromagnetic energy pulses in much the same way. The radio-frequency(RF) energy is transmitted to and reflected from the reflecting object.

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A small portion of the reflected energy returns to the radar set. This returned energy is called an ECHO, just as it is in sound terminology. Radar sets use the echo to determine the direction and distance of the reflecting object.

## **1.5 Aim and Objectives:**

The main aim of this project is to analyze, design and implement a new radar jammer system that can protect the conventional radar systems and interfere attacker's radars. The main objectives of this project are as follows:

1. To analyze the radar transmitter and receiver signal and circuit.
2. To propose a new design for radar jammer that can cope with various radar pulse shapes and frequencies.
3. To simulate the proposed circuit in a simulation environment.
4. To test and analyze the simulated circuit for various pulse shapes and frequencies.

## **1.6 Research Outlines:**

**Chapter 1** presents introduction of this project, where it contained Radar Jammer, problem statement, proposed solution.

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**Chapter 2** shows the background and literature review of radar, types of it, in addition to, the basic principle of radar and it's functions.

**Chapter 3** shows the necessary theoretical for the project such as jamming and types of radar jammer.

**Chapter 4** presents the methodology of system design of radar jammer.

**Chapter 5** presents the simulation process and resulting figures. In addition to, conclusion, references and proposes some aspects that can be investigated for a future work.