

Intelligent Life Detection System

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Abstract— The ability and use of microwave life detection system to detect and search for the humans buried under rubble or collapsed building or laid behind multiple barriers has been investigated. Based on the movement and fluctuation of heart of a human under various layers of barriers and the detection ability of Doppler frequency a system has been proposed. This system operating at 1150MHz can remotely detect the behavior of the trapped alive person. The operation principle is based on the microwave signals reflected from the period moving part of a living person body such as heart or lungs. In this paper various parts of the microwave life detection system such as patch antenna, directional coupler, power amplifier and low noise amplifier and life detection system software are simulated using ADS2003A. In addition, by using the simulated software, an overall performance of system has been investigated.

Keywords: X-band , Doppler Radar, ADS, Modulated Beam, Simulation, Remote Control, Patch Antenna, Directional Coupler.

I. INTRODUCTION

Nowadays, various parts of the world are faced by natural disasters (i.e. landslide, Earthquake). Such disaster causes lots of life. Detection of alive person can save his life. Conventional methods to detect the trapped person under rubble such as the utilization of dogs and optical devices [1], are not effective when victim trapped under the multiple buried layers or the alive persons are very weak to respond to the rescue team. Therefore there is need for constructing a life detection system to find and search the location of trapped person as early as possible. A microwave life detection system which operates at the X-band (10 GHz) for such a purposed was constructed in 1980 [2], [3].

In this paper, a life detection system is designed for operating at 1150MHz. The various parts of system such as power amplifier, low noise amplifier, directional coupler are designed and simulated by using Proteus software. An overall performance of system is simulated using ADS2003A software and Microwave Office software.

II. LITERATURE SURVEY

To conduct rapid rescue operation there is a need for timely information on the exact position of trapped human and information on the state of victim health. The concept of microwave life detection system was emerged with the development in the system for rescue operation. Initially dogs are use to detect the person but they only detects dead persons then optical devices but they need expert to handle and monitor them. The rescue robots are also used for rescue deep aside but they unable to trapped once they go out of range.

The history of “Revolutionary System to detect Human Being Buried Under the Rubble” starts with K. M. Chen who brings out the concept of detection of buried victims using microwave beam in 1985[4]. After the detailed study of microwave signals and Doppler’s effect, Ku Mem chen had been proposed including the basic principle for the operation of life detection system in 1991[5]. A Low Power Hand-Held Microwave Device for the Detection of Trapped Human Personnel by W. S. Haddad in 1997[6]. The device, called the Rubble Rescue Radar (RRR) incorporates Micropower Impulse Radar technology which was developed at Lawrence Livermore National Laboratory over the few years. In 2003 P.K. Banerjee and A. Sengupta proposed the basic block diagram for the clutter cancellation system. In 2004, there was a concept of three band radar system proposed by M. Bimpas[7].

The researcher put their effort to study the various effect various bands of microwave signals and depending upon this, a system which detect human being with ka-band with double sidebands have been proposed, in 2006. It states that a short wavelength of ka-band increases the sensitivity of antenna which will detect the small body vibration [10]. A paper on ‘An X-band microwave life detection system’ has been presented by Huey Ru in 2007. In this paper author present the idea of detecting human being located behind the wall using a microwave signal [8]. The phase change of a reflected microwave signal will provide the precious information about the buried victim’s heartbeat as well as breathing [9]. A rescue radar system is proposed by M. Donelli in 2011. In radar system a SAW oscillator is used to generate 10GHz frequency signals. While receiving through patch antenna the signal is

process by the ICA (Independent Component Algorithm)[2].

III. PHYSICAL PRINCIPLE OF DOPPLER FREQUENCY RADAR

The principle of detection is firstly, microwave signals are send through rubble to detect signs of a live life. Microwave having the property to penetrate through rubble and reflect back from object. These objects include alive person. When the beam hits the body, the signal reflected with additional modulation which created by movement of alive person body. So, the received reflected signals show the presence of alive human inside the rubble.

Fig.1. depicts the block diagram and signal flow of Doppler radar system is used to detect periodic target motion of an object. A resident wave of frequency is related to the Doppler frequency and the reflected waves of the object. To extract the Doppler shift frequency, the reflected wave is multiply by the signal radiated to the target object. Then the output of system is filtered by low pass filter with cutoff frequency about 4Hz.

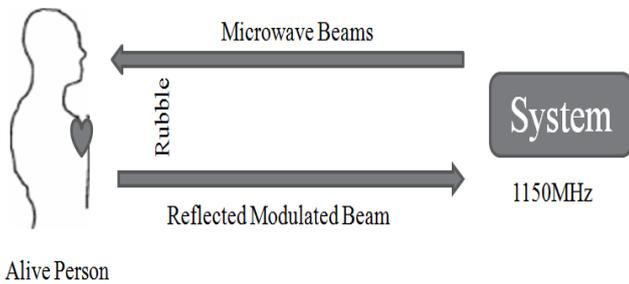


fig.1. The principle operation of Doppler radar

IV. PROPOSED SYSTEM

We proposed “An Intelligent Life Detection System” to detect human being buried under rubble by making use of radio frequency is introduced. A microwave life detection system which operates at the X-band (8-10 GHz) for such a purposed was constructed in1980 [1], [5]. The ability and use of X-Band frequency to detect and search for the humans buried under rubble or collapsed building or laid behind multiple barriers has been investigated. Based on the movement and fluctuation of heart of a human under various layers of barriers and the detection ability of X-Band frequency a system has been proposed. This system operating at 10.525GHz can remotely detect the behavior of the trapped alive person. The operation principle is based on the X-Band frequency wave reflected from the period moving part of a living person body such as heart or lungs. In this paper various parts of the intelligent life detection system such as X-band

motion detector, PIC-Controller, power amplifier and low noise amplifier and intelligent life detection system software introduced. In addition, by using the Proteus simulated software, an overall performance of system has been investigated.

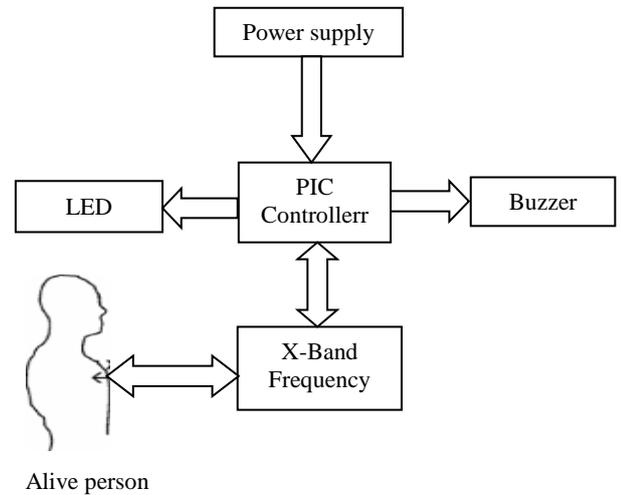


Fig 2. System Architecture

V. CONCLUSION

The proposed system will search and rescue the alive person under the rubble or collapsed building in minimum time and saves precious life. It will remotely controlled.

REFERENCES

- [1] Chen, K. M., D. Misra,H. Wang,H. L. Chueng,et al.,“An Xband M/W life-detection system,” Trans. Biomedical Eng., Vol. BME-33,697–701,July 1986.
- [2] M. Donelli,”A rescue radar system for the detection of victims trapped under rubble based on the independent component analysis algorithm.” Progress In Electromagnetics Research, M, Vol. 19, 173-181, 2011.
- [3] A. Izadi, Z. Ghatan, B. Vosoughi Vahdat and F. Farzaneh, “Design and Simulation of Life Detection System Based on detection of the Hear Beat Using Doppler Frequency,” IEEE International Symposium on Signal Processing and Information Technology, 2006.
- [4] Aggelopoulos, E. G., E. Karabetsos, Constantinouan N. Uzunoglu, “Mobile microwave sensor for detection of trapped human beings,” Measurement: Journal of the International Measurement Confederation, Vol. 18,No. 3,177–183,July 1996.
- [5] Chen KM, Huang Y, Zhang JP, Norman A, “RF lifedetection systems for searching human being”, IEEE

TRANSACTIONS ON BIOMEDICAL ENGINEERING,
Pages 105-114, JAN 1991.

[6] W. S. Haddad, “The Rubble Rescue Radar (RRR): A Low Power Hand-Held Microwave Device for the Detection of Trapped Human Personnel”, Work performed under the auspices of the US. Department of Energy by the Lawrence Liver more National Laboratory under Contract W-7405-Eng43. APRIL 1997.

[7] M. Bimpas, N. Paraskevopoulos, K. Nikellis, D. Economou and N. Uzunoglu, “Development of a three band radar system for detecting trapped alive humans under building ruins” Progress in electromagnetic research, pier 49, 161–188, 2004

[8] M. D'Urso, “A SIMPLE STRATEGY FOR LIFE SIGNS DETECTION VIA AN X-BAND EXPERIMENTAL SET-UP” Centro Ricerche Giugliano, SELEX Sistemi Integrati SpA Via Circumvallazione Esterna di Napoli, zona ASI, Giugliano, I-80014, ItalyProgress In Electromagnetics Research C, Vol. 9, 119{129, 2009

[9] Wu, C. W. and Z. Y. Huang ,”Using the Phase Change of a Reflected Microwave to Detect a Human Subject Behind a Barrier” IEEE Transaction Biomedical Engg, Vol. 55. No. 1, 267-2272, 2008.

[10] Yanming Xiao; Changzhi Li; Jenshan Lin; “Accuracy of A Low-Power Ka-Band Non Contact

Heartbeat Detector Measured from Four Sides of A Human Body ” Dept. of Electr. & Comput. Eng., Florida Univ., Gainesville, FL,: Microwave Symposium Digest, 2006. IEEE MTT-S International June 2006.