Comparison Of Microstrip Antenna and Microstrip Antenna With Slots For Microwave Life Detection System.

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ABSTRACT
The Microstrip Antenna for microwave life detection system is used for the search and rescue of victims trapped under the rubble of collapsed building during the earthquake or other disasters. The performance and advantages of microstrip antennas such as low Weight, low profile, and low cost made them the perfect choice for microwave life detection system. They have the capability to integrate with microwave circuits and therefore they are very well suited for applications such as microwave life detectors, navigation systems, cell devices, WLAN applications, navigation systems and many others. In this Paper the design of a single element microstrip patch antenna and microstrip patch antenna with slots for a microwave life detection system are compared using IE3D software. Also the directivity of the simulated Microstrip patch and microstrip patch antenna with slots is compared using simulation software.

Keywords- Microstrip Antenna, Microwave life detection system.

1. INTRODUCTION
The Microstrip Patch Antenna is a single-layer design which consists generally of four parts (patch, ground plane, substrate, and the feeding part). Patch antenna can be classified as single – element resonant antenna. Once the frequency is given, everything (such as radiation pattern input impedance, etc.) is fixed. The patch is a very thin (t<< λo, where λo is the free space wavelength) radiating metal strip (or array of strips) located on one side of a thin no conducting substrate, the ground plane is the same metal located on the other side of the substrate. The metallic patch is normally made of thin copper foil plated with a corrosion resistive metal, such as gold, tin, or nickel. Many shapes of patches are designed and the most popular shape is the rectangular and circular patch. The substrate layer thickness is 0.01–0.05 of free-space wavelength (λo). It is used primarily to provide proper spacing and mechanical support between the patch and its ground plane. It is also often used with high dielectric-constant material to load the patch and reduce its size. The substrate material should be low in insertion loss with a loss tangent of less than 0.005. In this work we have used Arlon AD 410 with dielectric constant of 4.1 and tangent loss of 0.003. Generally, substrate materials can be separated into three categories according to the dielectric Constant [1] [2].

1. Having a relative dielectric constant in the range of 1.0–2.0. This type of Material can be air, polystyrene foam, or dielectric honeycomb.
2. Having dielectric constant in the range of 2.0–4.0 with material consisting mostly of fiberglass reinforced Teflon.
3. with a dielectric constant between 4 and 10. The material can consist of ceramic, quartz, or alumina.

The advantages of the microstrip antennas are small size, low profile, and lightweight, conformable to planar and non planar surfaces. It demands a very little volume of the structure when mounting. They are simple and cheap to manufacture using modern printed circuit technology. However, patch antennas have disadvantages. The main disadvantages of the microstrip antennas are: low efficiency, narrow bandwidth of less than 5%, low RF power due to the small separation between the radiation patch and the ground plane(not suitable for high-power applications).
II. LITERATURE SURVEY
Most of the victims of earthquake or other natural disasters in the various parts of the worlds are trapped under rubble of the collapsed buildings. A detection of the victims can save his life. As in the radar application, the phase of the incident wave can be changed due the body vibrations. Depending upon this fact Microstrip Antenna to Detect Human Being Buried under the Rubble used to trap the buried victims under earthquake rubble or collapsed buildings by the utilization of microwave radio frequency has been design.

The Microstrip Antenna for microwave life detection system can works on different range of frequencies from L-band (2GHz) to X-band (10GHz). But X-band microwave is unable to penetrate deep into the rubble. It can penetrate rubble up to 1.5 ft in the thickness (5 layers of bricks) while L-band can penetrate the rubble of about 3 ft in thickness (10 layers of bricks). Due to the fact that lower frequency will be more capable of detecting vital signs through very thick rubble, so frequency of an electromagnetic wave needs to be in the L-band or S-band range. For this reason, the a microwave life detection system which operates on the L-band frequency[3]. This system is supposed to quite efficient to trap the breathing and heartbeat signals of victims who are completely trapped and too weak to respond.

III. PROBLEM STATEMENT AND OBJECTIVE
Microstrip Antenna for Microwave life detection systems are effective in searching for human beings trapped under earth quake rubbles even if the rubble or debris covering the human victims is thicker than a few feet, especially for the case when the victims are completely trapped or too weak to respond to the signal sent by the rescuers. The Microstrip Antenna is an integral part of microwave life rescuing system. The compactness and portability of a microwave life detection system depend mainly on the miniaturization of the antenna used, which can be realized using a microstrip patch antenna. The efficiency of the existing microwave life detection system can be raised by increasing Efficiency and Bandwidth of Microstrip Antenna.

Microwave life detection system work in the L band, Since L band microwave signal penetrate large distance and is less affected by the presence of moisture compared to X band, it is better to use L band for life detection [2]. This work proposes the design of a single element microstrip patch antenna and a microstrip antenna with slots for a microwave life detection system at the L band. The simulations are done in IE3D. Also the return loss and gain of the simulated Microstrip and Microstrip antenna with slots are compared. These antennas can also be used for various other applications in L band as WLAN, RF ID systems and other sensors.

IV. SIMULATION OF A 2.4 GHZ PATCH ANTENNA FOR MICROWAVE LIFE DETECTION SYSTEM USING IE3D.

Figure 1. Layout of Microstrip Antenna in IE3D Software.

Figure 2. Return Loss of a Microstrip Antenna.
A. Comment on Return Loss of a Simulation of a 2.4 GHz Patch Antenna using IE3D.

The portion of a signal is reflected by the end of line termination as seen in Fig 1. Or cannot cross an impedance change at some point in the transmission system refers as Return loss. RL is a matter of serious concern on any transmission system for a digital television signal, and knowing the magnitude of the Return Loss at the sending end termination, receiving end termination, and each and every connecting cable is of primary concern. That’s why it should be as small as possible. To achieve good radiation efficiency the return loss should be less than -9.5 dB [1]. Fig. 2 shows the return loss of the Microstrip Antenna.

B. Comment on VSWR of Microstrip Antenna.

When there is mismatch of impedance between terminated line and characteristic impedance of the transmission line (cable), due to this reflection of power arises from terminated line. Part of the power is reflected back down the transmission line. The forward (or incident) signal mixes with the reverse (or reflected) signal to cause a voltage standing wave pattern on the transmission line. The ratio of the maximum to minimum voltage is known as VSWR, or Voltage Standing Wave Ratio. The BW is usually specified as frequency range over which VSWR is less than 2 (which corresponds to a return loss of 9.5 dB or 11 percent reflected power). Fig. 3 shows the VSWR of the Microstrip Antenna.

V. ANALYSIS AND OPTIMIZATION OF A MICROSTRIP ANTENNA WITH SLOT FOR MICROWAVE LIFE DETECTION SYSTEM [4].

Comment: With the help of slots in microstrip antenna as seen in Fig 4. Bandwidth increases as seen in Fig 5. Which is calculated at 9.5dB and this increase in bandwidth is useful for Microwave Life Detection System.

VI. CONCLUSIONS

From the above simulation results of microstrip antenna and microstrip antenna with slots we can say that microstrip antenna with slots are having larger bandwidth as compared to microstrip antenna without slots as seen in Fig 2. and Fig 5. at 9.5dB which will be useful for Life Detection System as we can gather more information about victims of earthquake or other natural
disasters in the various parts of the world are trapped under rubble of the collapsed buildings.

VII. REFERENCES


