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An Accurate Characterization of Different Water Properties Using Resonant Method for Underwater Communication Activity

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Abstract. Underwater communication has a great importance in either industrial, military or for scientific purposes. The applications of underwater communication such as pollution monitoring, underwater surveillance and collection of scientific data from the bottom of the ocean require specific development of devices. In order to design these crucial devices for such activities, an accurate characteristics of water involved should be noted. The velocity of signal propagates in underwater is different from the speed of light in free space and closely related to complex permittivity. There are few types of water bodies such as rivers, streams, pond, bays, gulfs and seas where each of them possessed different characteristics. In this paper, the main focus is to determine the water bodies' characteristics by using material characterization method. This paper provides the characterization of the different water bodies such as tap water, river water, sea water and lake water where the complex permittivity are determined by using resonant method. Estimated complex permittivity of different water are in good agreement with existing method and the present method shows a great potential to be used in characterizing wide-variety of liquid samples.

Keywords: Underwater Communication, Sea Water, Complex Permittivity, Resonant Method.

1 Introduction

In recent year, communication devices such as mobile phone and personal computer are very essential to keep one's connected with others. It is not limited only to terrestrial and satellite systems, researchers are now focusing on underwater communication systems to provide the same facility for underwater environment [1]. However, the underwater communication is much more complex than the terrestrial communication due to the degradation of wave propagation velocity. In the free space, the propagation velocity of signal/wave is equal to speed of light. In other word, the effect of the permittivity can be ignored since the relative permittivity of free space is 1 and the velocity can be