

Measured Dielectric Permittivity of Chlorinated Drinking Water in the Microwave Frequency Range

Ahmad H. Abdelgwad, Tarek M. Said*

Department of Electrical Engineering, Fayoum University, Fayoum 63514, Egypt

ABSTRACT The safety of drinking water is directly dependent on the chlorine content and therefore the study gains its importance. Chlorinated water is safe to drink as long as the levels of chlorine comply with the water quality factors. The purpose of this research is to study the effect of chlorine concentration on the complex dielectric permittivity of water. The measurement of the complex permittivity of chlorinated drinking water is reported in the frequency range 500 MHz – 4 GHz using open-ended coaxial probe technique. Measurements are carried out using a dielectric assessment system associated with an automatic network analyzer and a dielectric probe connected to a computer. The experimental set up is described and the procedure followed to obtain an effective permittivity data is outlined. These measurements are, to the best of the author's knowledge, the first of its kind to be published. The dielectric constant and loss factor for all measured samples are analyzed and the effect of the chlorine concentration is studied. The results indicate that chlorine content has a significant effect on both dielectric constant and the loss factor. The Loss factor is more sensitive than the dielectric constant to changes in the chlorine concentration. Results of this work show that microwave sensing is an effective methodology for monitoring water quality and possible contamination.

KEYWORDS Complex permittivity, chlorinated water, chlorine concentration, microwave sensing.

*Address all correspondence to: Tarek M. Said, Fayoum University, Faculty Group, Electrical Engineering Department, E-mail: tms02@fayoum.edu.eg