

Microwave Detection of Water Pollution in Underground Pipelines

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ABSTRACT An electromagnetic model is proposed to detect water pollution in underground pipelines. Contaminants present above a certain level in water can be a public health hazard. The contrast in the dielectric constant between contaminated and fresh water is one of the most important parameters to be considered for detecting the presence of pollutants in water. Simulations of frequency response and time domain pulse wave through a multi-layer medium are presented. The complex dielectric permittivity of polluted water has been measured as a function of frequency and analytically represented by Cole-Cole fit model. Water pollution can be detected by observing the variation of the reflection coefficient or reflected signals from unpolluted and polluted water. 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. Microwave technique discussed in this manuscript for water pollution study is a pioneer technique to detect various pollutants in water.

KEYWORDS Remote sensing, water pollution, Cole-Cole model, ground penetrating radar (GPR), reflection coefficient

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