

Developing of A Ground Penetrating Radar Antenna for Detecting Water Pollution in Underground Pipelines

Ahmad H. Abdelgwad, Tarek M. Said*, Amr M. Gody

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

ABSTRACT Full wave analysis of a prototype laboratory model of a pipe buried in sandy soil is used to examine the feasibility of using ground penetrating radar in detecting water pollution in underground water distribution systems. A wideband microstrip patch antenna with half and defected ground plane is designed for detection of pollution in buried plastic water pipes. The contrast in the dielectric constant between pure and polluted water is one of the most important parameters to be considered for detecting the presence of pollutants. The complex dielectric permittivity of water is measured and analytically represented by Cole-Cole fit model. The experimental set up is described and the procedure followed to obtain an effective permittivity data is outlined. Microwave technique developed in this manuscript is proved as a successful non-destructive technique in detecting water pollution in buried pipes.

KEYWORDS water pollution, ground penetrating radar, reflection coefficient, microstrip antenna design.

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