ABSTRACT

Walls as an obstruction became the main problem that needs to be overcome when implementing Through the Wall Radar (TWR) for certain purposes. Wall cause a closure effect on the target's reflected signal and made it difficult in detecting the targets and delays caused by the wall can reduce accuracy in detecting location. Wall characteristics are required to achieve increased accuracy, so that the objects can be detected precisely.

Deconvolution is used for the extraction of wall effects, as well as eliminating the effects of electromagnetic signals reflected from the walls, but the obtained results are not accurate. One of the inaccuracies in detecting objects behind the wall is the location of the object that is too close to the wall. Delay estimation method is used as the basis for correcting the distance from the wall to the target.

In the proposed research, tests were carried out for the electrical characterization of each type of wall material, namely using printed stone and wood walls. The Through the Wall radar (TWR) system is modeled on a Vector Network Analyzer (VNA) with the Vivaldi Antenna as a transmitter and receiver of electromagnetic waves. At the processing stage, the results of the experimental signal processing are carried out so that the reference signal can be identified and a reconstruction signal is made of any effects that exist in the experiment. Based on the results of the reference signal and reconstruction signal for each effect, the characteristics of the tested barrier wall characteristics can be analyzed. Laboratory experiments were carried out to investigate the performance of the proposed method.

Analysis of the experimental results obtained that the form of the signal response from the printed brick wall is more solid so that it inhibits the propogation of the TWR signal which causes the phase shape of the effect of the printed brick wall to be wider than the plywood barrier. The deconvolution method can compensate for the wall effect so that the object is easier to identify, while the delay estimation method can reduce the information delay caused by the wall effect, so that distance correction can be done.

In monitoring phase 1, modeling of the TWR radar system was carried out in laboratory experiments using VNA which was used to prove the concept of proposed detection. Monitoring phase 2 and the final are carried out by laboratory experiments with different distance variations to determine the accuracy of detection on trough the wall radar. The results of the deconvolution method successfully compensate for the wall effect so that the object looks clearer and the delay estimation method can correct the distance with an accuracy of 2 cm

Keywords: TWR Radar, Deconvolution, delay estimation, wall effect.