

## ABSTRACT

Groundwater content is very important for actors in agriculture, civil science, and soil experts. The method in determining the water content in the soil is divided into two methods, namely direct measurement, namely the separation of water from the soil matrix while the measurement is indirectly the measurement of properties that are closely related to the soil. The use of radar systems in measuring water content in soil has the potential to increase measurement efficiency for large areas, where the time needed becomes shorter.

The ground water content detection radar system works with a wide bandwidth. The radar system needs to be supported by an Ultrawide-band (UWB) antenna. UWB antennas have a bandwidth of more than 500 MHz. The required characteristics include wide impedance, low ringing levels, and directorsal radiation patterns. UWB antennas are applied to Ground Penetrating Radar (GPR) because the bandwidth value is quite large.

This final project research design the Bow-Tie structure UWB antenna with the addition of an antipodal method that works frequency of 2 GHz with Ultrawide-band bandwidth value. Bow-Tie antennas are designed using the help of software applications with predefined parameters and specifications then fabricated using FR-4 Epoxy materials. It is then tested on a radar system modeled with a Vector Network Analyzer (VNA) to find out the value of Return loss, bandwidth, and VSWR and then compared the results of software simulations with fabrication results. Returnl loss simulation results are worth -32,580 with a bandwidth of 997 MHz while fabrication measurement results are worth -22.53 with a bandwidth of 990 MHz and VSWR simulation results are worth 1,048 at a middle frequency of 2,062 GHz (1,912 GHz – 2,953 GHz) while fabrication measurement results are worth 1,161 at a middle frequency of 2.39 GHz (1.45 GHz – 2.45 GHz).

**Keywords:** Soil Water Content (SWC), Ultra Wideband (UWB), Antenna, Bow-tie, Metode Antipodal