Microwave Subsurface Imaging System

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The majority of Ground Penetrating Radar systems on the market today employ a linear multi-static antenna array. To reconstruct images of underground objects, the entire system is moved along a series of parallel linear paths. Depending on the size and scope of the target area, the system may need to travel long distances and require a significant amount of time. In addition, some objects do not produce clear images from a linear scan because the system is not able to capture coherent data for a proficient image reconstruction.

Our solution to these problems is a multi-static Ground Penetrating Radar system with circular data acquisition as seen in Figure 1. The antennas are placed in a linear array that is anchored to a base with an attached gear motor and a shaft encoder. The system allows the user to render a 3-D image of a circular subsurface area. The array is rotated by the motor so that the it completes one pass over a circular area rather than having to complete multiple linear passes over a rectangular area. The addition of the shaft encoder allows the network analyzer to accurately track the relative location of the antenna array needed for the image reconstruction algorithm. The proposed automated method not only saves time, but is also able to reconstruct a clearer image compared to the linear path method.

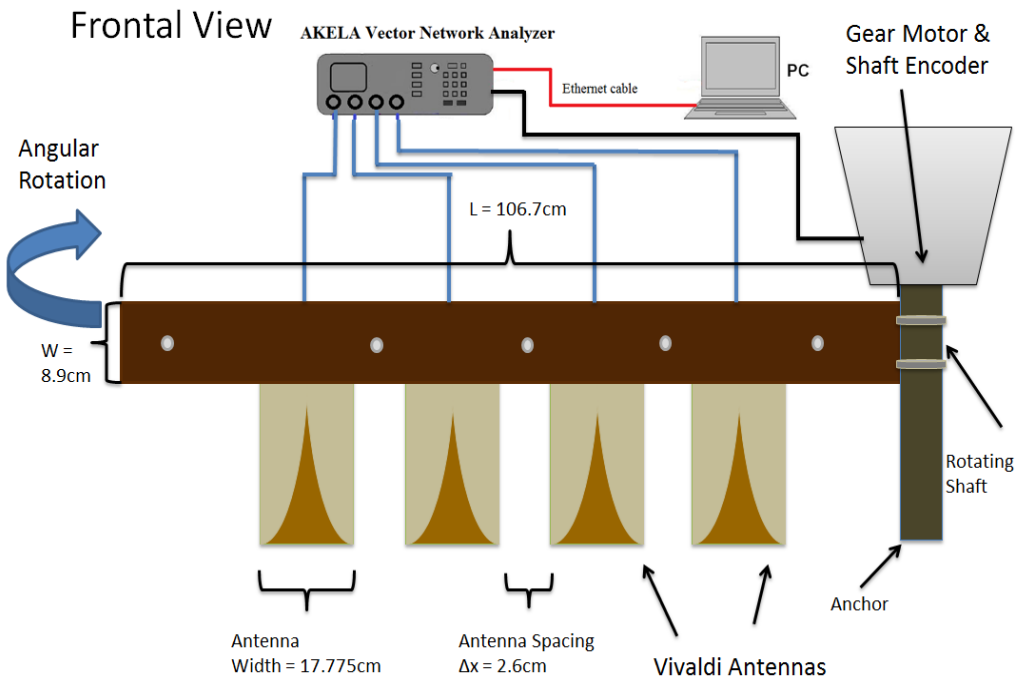

Figure 1. Frontal View of Ground Penetrating Radar

The final product may serve as a model for more advanced systems to be used for further practical applications in microwave imaging technology.