



U N I V E R S I T Y *of* H O U S T O N

Cullen College of Engineering
Department of Electrical and Computer Engineering
Graduate Office

N308 Engineering Bldg. 1
Houston, TX 77204-4005

Tel: (713) 743-4403
Fax: (713) 743-4402
Email: Ece_grad_admit@uh.edu

PhD Dissertation Announcement

Development of GPR Receiver Systems Using Pico-Second Sampling Technology

Ying Wang

Ground penetrating radar (GPR) is a geophysical survey method that has been developed over the past thirty years for shallow, high-resolution, subsurface investigations of the earth. GPR uses high frequency electromagnetic (EM) waves (generally 10 MHz to 1,000 MHz) to acquire subsurface information. When EM energy propagates downward into the ground, it will be reflected back to the surface from boundaries of media with different dielectric constant. GPR has been proven to be an excellent tool for nondestructive evaluation and inspection of underground structures.

The objective of this dissertation is to design Giga-Hertz sampling systems for GPR application. The introduction of GPR is given first. The operation of the sequential sampling method is described after that. Then sampling system design is divided in five parts according to the functions and the signal types of the circuit, the nano- and subnano-second pulse generator, sampling circuit, receiver circuit, power supply, and amplification and attenuation circuit. In each part, the operation of the circuit, the design considerations, the circuit analysis are presented. After the system design, the theoretical analysis of the system error and noise are derived. Based on the theoretical analysis, the possible noise sources in the system are discussed and the methods to eliminate or reduce the system error and noise are proposed. The lab test benches for debugging and testing the two kinds of sampling system are built up and the field tests are conducted to test the performance of the system. The field test results show that the sampling systems are robust and accurate enough for the evaluation and inspection of the highway structures.

Committee Chair: Dr. Richard C. Liu
Committee Members: Dr. Donald R. Wilton
Dr. Ji Chen
Dr. Dennis Clifford
Dr. David Zimmerman

Place: W342, Engineering Building 2
Date: November 12th 2007
Time: 3:30pm-5:00pm