

# FIRMWARE UPGRADES OF THE ACT 4-EIT SYSTEM

By

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## ABSTRACT

Electrical impedance tomography (EIT) is a medical imaging technique which involves mapping the electrical impedance distribution within the body based on measurements made using electrodes on the body's surface. The thesis discusses the hardware design for Rensselaer's ACT 4 EIT system and presents the details of several upgrades made to improve several aspects of the system performance. One of the upgrades provided to the system is inclusion of additional operating frequency of 500 kHz. The matched filter is a crucial part of the digital hardware that is used in measuring the voltages. A detailed analysis of the various delay parameters involved in the working of the matched filter is presented along with a way to change the matched filter integration time to increase/decrease the speed of operation of the ACT 4 system. The matched filter parameter values are now set at the Graphical User Interface. Another improvement is the implementation of a technique to disconnect electrodes not making contact with the breast at the FPGA level. Experimental results are presented that verify the operation of the improvements.