

Postgraduate Student: **Sofia Alysandratou**

Thesis' Title:

Development and evaluation of a data acquisition system for nuclear medicine imaging systems based on a FPGA (Field Programmable Gate Arrays)

Abstract:

During the last decade there has been significant progress in developing for data collection circuits for medical imaging devices, as well as recording biological signals. The major objective of a data acquisition system is to collect and pre-process large amounts of data with maximum sensitivity, reduced size and cost. The use of Field – Programmable Gate Array (FPGA) gets attention as they can be combined with fast digitizers doing part of the pre-processing of the signal and transmission to a PC.

The main objective of the present thesis is the development of a simple, data acquisition tool, which provides accurate results for nuclear imaging applications (SPECT), based on position-sensitive photo-multiplier tubes (PSPMTs). The system is based on a Xilinx Spartan3E Starter Kit, which is one of the simplest FPGA evaluation boards. Two dual channel, external, 12 bit analog to digital converters with a sampling rate of 1 Msps per channel (ADC) were used. The ADCs' functionality was described in VHDL. Data was transmitted to a standard laptop via Ethernet. The embedded system was designed with Xilinx's Embedded Development Kit (EDK) and was based on Xilinx's Microblaze soft-core processor.

The results have shown that the FPGA data acquisition system provides accurate digitization of the PSPMT anode signals, when compared with standard analog electronics. As a results systems complexity and cost is significantly reduced, while performance is maintained.

Examining Committee:

Phd. Ioannis Kandarakis, Professor, Department of Medical Instruments Technology, TEI-A
(thesis advisor)

Phd. George Loudos, Assistant Professor, Department of Medical Instruments Technology, TEI-A

Phd. Dionisis Cavouras, Professor, Department of Medical Instruments Technology, TEI-A