Contribution ID: **94** Type: **Poster presentation**

A Digital On-line Implementation of a Pulse-Shape Analysis Algorithm for Neutron-gamma Discrimination in the NEDA Detector

Tuesday, June 7, 2016 3:00 PM (1h 30m)

Modern nuclear physics experiments involving fusion-evaporation reactions frequently require the detection of particles (alphas,protons,neutrons) which provide crucial information about the nucleus under study. Some reaction channels involving neutron detection have very low-cross section and require the use of large scintillator arrays which are also sensitive to the gamma-rays, hence, meaning that neutron-gamma discrimination (NGD) techniques must be applied. Besides, due to the high counting rates at which the experiments are carried out and the need of using digital electronics, the NGD is expected to be implemented digitally in the earlier stages in order to decrease the total data throughput which would be mostly produced by the gamma-rays.

NGD has been largely used in a wide assortment of neutron detectors (Neutron Wall) using analog electronics employing pulse-shape analysis (PSA) techniques such as the zero cross-over (ZCO) and charge-comparison (CC) methods. Due to the inherent limitations of the analog electronics, an effort is put into moving these PSA methods for NGD to the digital domain using programmable devices such as FPGA, so a higher degree of flexibility and integration can be achieved without losing performance in terms of the discrimination performance.

In this paper we analyze the performances, complexity and resources of two widely-used PSA algorithms (Zero-CrossOver and Charge Comparison) in order to implement them using digital electronics based on FPGA. The chosen algorithm will be set in the new-digital electronics of the NEDA (Neutron Detector Array) detector, currently in a development stage. It is expected, by employing this algorithm in an FPGA, to provide a simple mechanism to discard a large amount of gamma-rays while preserving the flexibility and robustness that digital systems offer.

Primary author: EGEA CANET, Francisco Javier

Co-authors: BOUJRAD, Abderrahman (GANIL); TRIOSSI, Andrea (CERN); GADEA, Andrés (IFIC); HOUARNER, Charles (GANIL); SANCHIS PERIS, Enrique (Universitat de Valencia); DE FRANCE, Gilles (GANIL); TAYFUN, Huyuk (IFIC); LAZARUS, Ian (STFC Daresbury Laboratory (GB)); GRZEGORZ, Jaowrski (LNL); NYBERG, Johan (Uppsala University); VALIENTE DOBON, Jose Javier (LNL (INFN)); JASTRZAB, Marcin (Universita dell'Insubria-Unknown-Unknown); TR Michel (GANIL); VICTOR, Modamio (Universitet i Oslo); MAREK, Moszynski (National center for nuclear research, Otwock-Świerk, Poland); ERDURAN, Nizamettin (Istanbul Sabahattin Zaim University); SÖDERSTRÖM, Pär-Anders (Department of Nuclear and Particle Physics, Uppsala University, Uppsala); WADSWORTH, Robert (University of York); ERTURK, Sefa (Physics Department); GONZALEZ MILLAN, Vicente (Instituto de Fisica Corpuscular (IFIC) UV-CSIC)

Presenter: EGEA CANET, Francisco Javier

Session Classification: Poster session 1

Track Classification: Real Time System Architectures and Intelligent Signal Processing