Contribution ID: **1204**   Type: **Oral**

Optimization of digital parameters and off-line sorting code for experiments at the ISOLDE Decay Station (IDS)/CERN.

Wednesday, 1 November 2023 16:25 (15 minutes)

The Isotope Mass Separator On-Line Device (ISOLDE), is an experimental setup at CERN is dedicated to the topical theme: β-decay kinetics spectroscopy studies for research into nuclear structure, nuclear engineering, and astrophysics. UWC has a leading experiment approved at IDS. To investigate nuclear shape coexistence in 80,82Sr nuclei

with the beta decay of 80,82Y. The study aims at measuring internal conversion electrons using the SPEDE electron spectrometer, branching ratios with four germanium clover detectors, and lifetimes with two LaBr3(Ce) detectors. These measurements will complement our investigations of shape effects in 80,82Sr using safe multi-step Coulomb excitation measurements carried out at TRIUMF. The new Modern African Nuclear Detector Laboratory (MANDELA) at the University of the Western Cape is equipped with a double photon counting setup using NaI(Tl) scintillation detectors and a 250-MHz Pixie-16 digitizer from XIA. This digitizer is similar to the 100-MHz Pixie-16 digitizers in use at IDS. The technical description of the pixie-16 spectrometer card device is

presented in this work along with the γ-γ experimental demonstration using the double photon counting setup with NaI(Tl) scintillation detectors arranged in symmetrical rings placed relative to the radioactive Co-60 source, which is coupled to the interrogated PMT base. Data is acquired using the acquisition code POLL2, which is also

responsible for readout and visualization of the Pixie-16 list-mode experimental data, it is regarded as the main DAQ program composed of a user-friendly environment for functions and command-lines interface (CLI), which uses text command threads with a devised method for entering them that enables the users to directly enter commands in the ROOT terminal to be performed by the centOS7 operating system, which is composed of an advanced graphical user-friendly interface (GUI Linux) to help users monitor and debug the detection system in either real-time or off-line mode to establish data acquisition, spectral analysis, and optimization of digital parameters to further toggle the channel and module digital parameters embedded in the paass-lc package.

The off-line mode event reconstruction is tackled so as to obtain correction values of resolution offsets of scintillator detectors by optimizing extrinsic properties of resolution degradation artifacts such as defects in signal fidelity with pulse shape analysis model

prior. In list mode, the energy and time for each event are stored in a runfile (e.g., run00 .ldf). These .ldf format files should be in the same folder where the data is acquired. Results such as single energy distributions and typical prompt γ-γ matrix spectra are acquired. Results in preparation of our new experiment at CERN, will be presented and

their implications discussed.

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Session Classification: Experimental Nuclear Physics

Track Classification: Experimental Nuclear Physics