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Disentangling PANDA's timebased data stream

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One of the physics highlights of the future PANDA experiment is to search for exotic states that have been predicted by theory, and whose properties are governed by the presence of valence gluons. Such exotic states can be formed directly and copiously in proton-antiproton annihilations. The challenge lies in reducing the enormous background yield while preserving a high efficiency for the detection of exotic hadrons. As the detector response of background events is very similar to that of the decay of the exotic states, the use of a conventional triggered readout scheme, where a limited number of subdetectors generates a trigger signal that engages the readout of the complete detector, is ruled out. Therefore, a new type of intelligent readout is being developed, where kinematic constraints are imposed online on reconstructed events. The high 20 MHz interaction rate can lead to overlapping detector response signals, creating so-called pile-up signals. Therefore, a different simulation approach is required, where events are no longer simulated sequentially, but are allowed to produce pile-up signals by letting simulated response signals interact with other signals in the same detector element for a set period of time. This means that the timestamp of each event (or even each hit produced by an event) plays a key role in the process, which is why this type of simulation is referred to as "timebased". Disentangling these overlapping signals and assigning them to the proper events may prove difficult. For the Electromagnetic Calorimeter, impinging particles create groups of hits in the detector, called clusters. To find the energy of these particles, the information from the hits in each cluster has to be recombined. Ideally, each hit in a cluster should belong to the event that spawned it, but this depends on the efficiency of the disentangling procedure. Some results of tests of the timebased simulation code and a macro for disentangling and recombining hits into clusters will be presented.

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