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FPGA online tracking algorithm for the PANDA straw tube tracker

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An FPGA based online tracking algorithm for helix track reconstruction in a solenoidal field, developed for the PANDA spectrometer, is described. Employing the Straw Tube Tracker detector with 4636 straw tubes, the algorithm includes a complex track finder, and a track fitter adopting Xilinx IP cores. Implemented in VHDL, the algorithm is tested on a Vertex4 FX60 FPGA chip with different types of events, at different event rates. A processing time of $7 \mu\text{s}$ per event for an average of 6 charged tracks is obtained. The momentum resolution is about 3% (4%) for p_t (p_z). Comparing to the offline tracking algorithm running at CPU, an improvement of 3 orders of magnitudes in processing time is obtained, however at 3 times worse resolution. The algorithm can deal with severe overlapping of events which are typical for interaction rates above 10 MHz.

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