

TDC based on FPGA of Boron-coated MWPC for Thermal Neutron Detection

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Summary

This paper describes theoretical and experimental work about TDC (Time To Digital Converter) based on FPGA (Field Programmable Gate Array) for boron-coated Multi-wire Proportional Chamber (MWPC) thermal neutron detector. Hit signal from MWPC detector is signaled with differential LVDS (Low Voltage Differential Signal) level by the front-end electronics (FEE), and fed to a NIM (Nuclear Instrument Module) time digitizing module. The time digitizer applies the methodology of combining coarse and fine time measurement and implemented in Xilinx FPGA. Each digitizer module can support up to 20 electrical channels. Lab experiments show the time resolution contributed by TDM is better than 35ps (RMS). Because of good time resolution of TDM, Lab experiments show the position resolution contributed by readout electronics is better than 0.2mm with 5ns delay unit. Joint test with neutron source for MWPC detector shows the integral position resolution is better than 3.5mm which can meet the requirement of thermal neutron detection.

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