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A Front-end Signal Digital Acquisition System In Intensive Electromagnetic Field Circumstance

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In Inertial Confinement Fusion(ICF), the laser-driven magnetic-flux compression can suppressing the heat losses through electron confinement, thus increasing the ion temperature as well as the neutron yield. The pulse magnetic field is created by discharging a high-voltage capacitor through a small wire-wound coil, and the Rogowski coil is used to measure the discharge current which can describe the corresponding magnetic field waveforms. In the ICF experimental, the signal from the Rogowski coil is usually transmitted to the oscilloscope through a long-distance coaxial cable. However, the electromagnetic interference caused by high-power loser will greatly affect the signal transmission.
A front-end signal digital acquisition system prototype is designed. The prototype is installed in an aluminum box and placed as close as possible to the Rogowski coil. The enclosure of the box is well grounded and sealed to shield the electromagnetic interference. The signal generated by the Rogowski coil passes the protection and shaping circuit. Then the signal is digitalized by the analog-to-digital convert(ADC), and the digital signal is recorded in field-programmable gate array(FPGA). The triple modular redundancy(TMR) is used to reduce the impact of signal-event upset(SEU) in the strong radiation environment. After the implosion process, the data is transmitted to the server by the wireless interface.
The outfield test result shows that the prototype can has a comparable performance as the oscilloscope for pulse magnetic field measurement.

Minioral

Yes

Description

system

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