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6.52 A multichannel gated neutron detector with reduced afterpulse rate for neutron time-of-flight measurements in strong x-ray circumstances

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Gated-photomultiplier-tubes (gated-PMT's) with increased robustness against background noises due to the hard x-ray incidence have been implemented on the 600-channel neutron time-of-flight (nTOF) detector at Institute of Laser Engineering (ILE), Osaka University. This diagnostic uses 600 individual neutron detectors consisting of a plastic scintillator and a liner-focused PMT, allowing to obtain a large detection area with long flight path (13.5 m). A very simple gating circuit has been developed to gate out the primary x-ray peak and measure the subsequent neutron signals without causing the anode current saturation. By applying a reverse potential between the cathode and first dynode (d1), we succeeded in suppressing subsidiary signals called "after pulse" produced after the main pulse (see Fig. 1), mainly due to ionic feedback to the photocathode. Cathode-d1 voltages of all the PMT's are simultaneously switched by only one switching circuit module coupled with a digital delay pulse generator (e.g. DG645) and a DC power supply. The switching circuit provides + 200-V precisely defined square pulse with a reasonably steep front of 80 ns. A high cut-off ratio of anode current of more than 103 can be obtained under constant illumination in the 'on' and 'off' conditions. Our design

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