

Design of Beam Monitoring Online System

Developed for the China Spallation Neutron Source (CSNS) Phase II upgrade project in Dongguan, a Beam Monitoring Online System (BMOS) based on 4H-SiC detectors has been implemented. Unlike the Beam Position Monitor (BPM), the BMOS adopts an indirect measurement strategy by positioning detectors at the beam edge (3.5 cm from the center) to avoid the high-radiation central region, thereby ensuring longevity and beam stability. The system collects proton flux signals from the edge region via integrating circuits and first-order CRRC shapers, digitizes them using an ADC, and processes the data in an FPGA. Using embedded algorithms, the BMOS reconstructs full beam intensity and position information within one second, based on a beam distribution model and a defined central beam area of $2\text{ cm} \times 2\text{ cm}$. Designed for an annual operational lifetime of 5000 hours, the system is expected to achieve beam intensity measurements with less than 5% error while maintaining long-term stability.

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Session Classification: Poster