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Signal processing, data acquisition, and initial commissioning results of the APS storage ring vertical beam missteering wire monitor

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The storage ring machine protection system (MPS) has been developed to protect the accelerator components from thermal damage by missteered high-power x-ray beams. The system consists of an array of different types of fault sensors. One of them is the resistive wire monitor used mainly to provide protection from global orbit missteering situations. Two wire monitors have been installed in the APS ID front ends to directly detect synchrotron radiation exiting the storage ring vacuum chamber that is missteered by ± 3 mm. Each wire monitor employs four in-vacuum tungsten wires positioned above and below the normal x-ray orbit. The temperature change of the wire under x-ray irradiation causes a resistance change which is detected by a local high-sensitivity low-noise signal processing electronics unit with four independent channels. The four outputs of the local unit are linked to a central VME wire resistance measurement and interlock module via 4-20 mA current loops. The central VME module can accept inputs from up to eight wire monitors and has a clock signal that feeds a MPS summation module. This paper describes the design and operation of the wire monitor signal processing and data acquisition system, summarizes the fail-safe and on-board test features of the system, and presents initial monitor commissioning results.

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