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A smart photon beam position monitor system for the Advanced Photon Source project

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At third-generation synchrotron radiation sources, such as the Advanced Photon Source (APS), the sensitivity and reliability requirements for the photon beam position monitors (PBPMs) are much higher than for conventional sources. Noise and contamination signals caused by the radiation emitted from bending magnets become a major problem. The conventional PBPM calibration process can only provide signal correction for one set of conditions for the insertion devices (ID). During normal operation, parameters affecting the ID-emitted beam, such as the gap of the ID magnets and the ring current, may be variable. A new smart photon beam position monitor system (SBPM) has been designed for the APS, which has a built-in, self-learning structure with EEPROM memory that is large enough to "remember operating conditions" complete with the source identification. During the self-learning mode, the monitor system initializes a series of automatic scan motions with information for different ID setups and records them into the database array. During normal operation, the SBPM corrects the normalized output according to the ID set up information and the calibration database. Thus, with this novel system, the PBPM is always calibrating itself with the changing conditions.

Patent applied for.