Development of a Real-time Timing-shutter Delay Monitor

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The Structural Biology Center, Sector 19 at the Advanced Photon Source, is a dedicated protein crystallography facility. Conducting successful experiments on low mosaic samples requires attention to all aspects of the experiment, including accurate shutter timing and synchronization. Signalling the timing-shutter to open or close can be synchronized with the scanning motor encoder, but knowing when the shutter actually opens or closes depends upon the delays inherent with the specific shutter. Because timing-shutters may be exercised in excess of 1-2 million cycles during their lifetime, delay times may change as shutter components age.

In order to accurately monitor the opening and closing delay times, we have designed a pin diode array in combination with fluorescence off the timing-shutter blade to monitor shutter delay times as they occur; the design is based on the existing design for the beam position monitor [1]. We use a Uniblitz x-ray shutter with a PtIr blade located downstream of the beam defining slits. The device is operated in air with He flowing into it from an attached scatter guard.

[1] Alkire R.W., Rosenbaum Gerold, Evans G., *J Sync. Rad.*, 2000, **7**, 61.
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