X-ray imaging for high speed moving objects usually requires a high burst of photons, in order for the images not to be blurred. In this paper a scanning method is described that reduces the demand on the source flux. With a 256x256 pixel detector system, it is possible to reduce the source flux by 256 times.

Method

The proposed method involves a 2D pixel layout with a readout system such as, for instance, the MEDIPIX3 system. Suppose that any given part of the object passes a column of pixels (one strip) at a given time period. In that time period a small number of photons can be collected from an X-ray source of reasonable flux, although not enough to resolve the object. If the intensity data of that column is stored, it can be added to the next adjacent column during the following time period it takes for the object to pass that column of pixels. The procedure is continued until the end of the pixel detector is reached, adding the intensity values of each new column to the summed column, enabling the acquisition of a full image. Enabling this summation for high velocities require hardware implementation resembling a shift register, where the memory banks for the columns are shifted to match the velocity of the moving object, thereby summing photons in real time.

Important aspects to consider are the limitations of a given setup, the source flux, the readout speed of the detector system, the quantum efficiency of the sensor etc.

Fig 1. Reference image of the object, without motion.

Fig 2. Object with motion, without mapping.

Fig 3. Object with motion, after mapping.

Fig 4. Final image.