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Development of noise component improvement for scintillator type X-ray image detector using silicon grid substrate

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X-ray image have been developed for medical and non-destructive inspection, and higher resolution and larger area detectors are required due to the development of technology. Therefore, in this study, the spatial resolution of a scintillation type image detector, which is an indirect conversion type X-ray image detector can be easily enlarged has been improved. The cause of lowering the spatial resolution of the detector is the diffusion of scintillation light within the detector. Therefore, the scintillator was optically separated using a silicon substrate in order to suppress the diffusion of this visible light. A detector element was fabricated by processing a silicon wafer into a grid and filled a scintillator in each pixel. This grid structure improved the spatial resolution of the scintillator-type image detector, however reduced the uniformity of the image by increasing the noise component. The purpose of this study is to improve the noise component of the scintillator type image detector using the grid structure. It is verified to improve noise component by increasing the detected emission intensity, and a method of applying reflectors to the walls of the grid and concentrating the visible light absorbed by the silicon was simulated. Therefore, the movement of visible light in a scintillator-type image detector using a silicon grid substrate was calculated using the Monte Carlo method. The spatial resolution, noise power spectrum and detection quantum efficiency were calculated with result of simulates and used as indicators for the realization of a scintillator-type image detector using a silicon grid substrate.

Topics

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