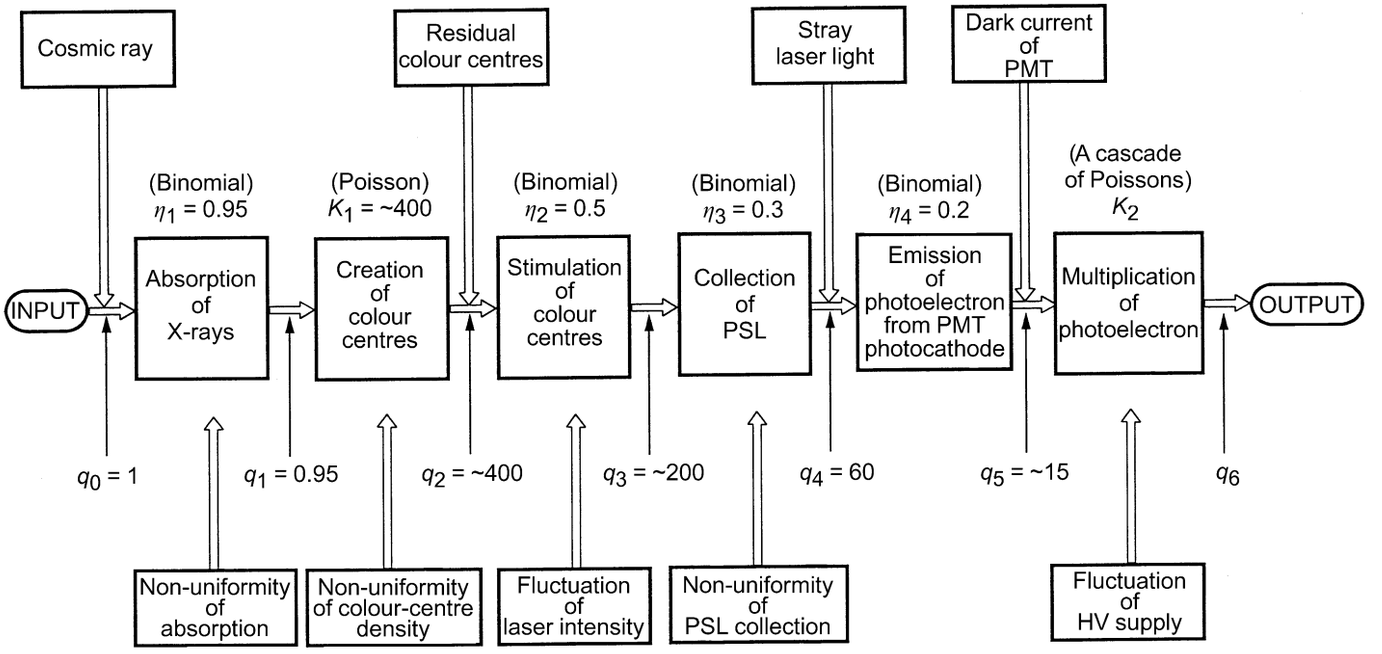

Fig. 7.1.8.4. Diagram showing a cascade of stochastic elementary processes during X-ray exposure and image read out of the imaging plate. The probability distribution of each stochastic process is described in parentheses together with the mean value. The numbers of the quanta, q_i ($i = 0, 5$), are also shown. The noise elements of the upper line contribute to the background noise, which reduces the DQE at lower exposure levels. The noise elements of the bottom line contribute to the system fluctuation noise, which reduces the DQE at higher exposure levels (Amemiya, 1995).

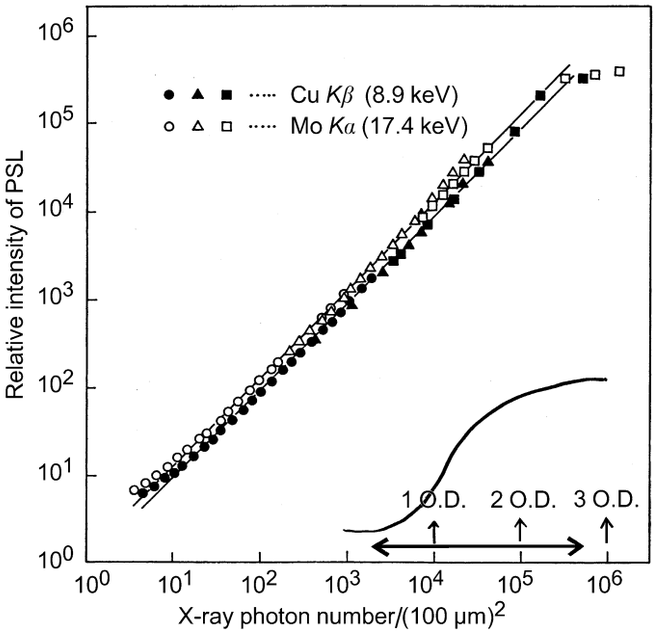

Fig. 7.1.8.5. Dynamic range of the photo-stimulated luminescence of the imaging plate. The dynamic range of typical high-sensitivity X-ray films is also shown. O.D. refers to optical density (Amemiya, 1995).

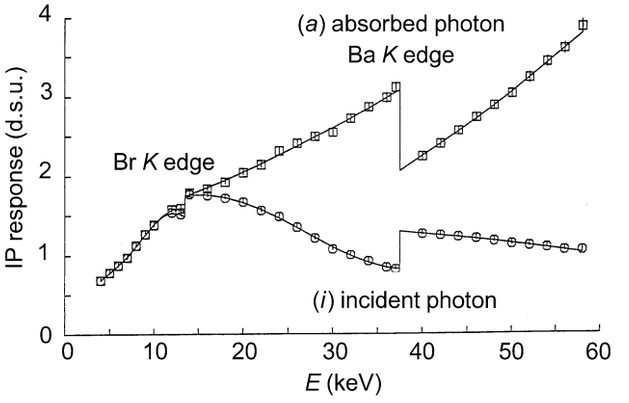

Fig. 7.1.8.6. Dependence of the IP response as a function of the energy of an X-ray photon. (*i*) is the IP response per an incident X-ray photon, and (*a*) the IP response per absorbed X-ray photon. The unit of the ordinate corresponds to the background noise level of the IP scanner (Ito & Amemiya, 1991).

The spatial resolution of the standard IP with a 100 μm laser scanning pitch is 170 μm at the full width at half-maximum (FWHM). The spatial resolution is limited by laser-light scattering in the phosphor during the read-out. A high-resolution IP that includes blue pigments in the phosphor to minimize the laser-light scattering has been developed. A spatial resolution of 43 μm is obtained at a 25 μm laser scanning pitch with the high-resolution IP with the sacrifice of 30% of the amount of PSL. The active area sizes of the available IP range from 127 × 127, 201 × 252, 201 × 400 to 800 × 400 mm.

The IP response per incident X-ray photon is shown as a function of the X-ray energy in Fig. 7.1.8.6, together with the deposited energy per absorbed X-ray photon. The abrupt decrease in the energy deposition above the barium *K*-absorption edge is due to the energy escape in the form of X-ray fluorescence. This effect is preferable because it makes the IP response curve smoother by compensating for the abrupt increase of the absorption efficiency at the absorption edge.

references