

A Study of the Relationship between Absorbed Energy and DR Pixel Values Using SPEC-78

Do-II Kim¹ · Hyoung-Koo Lee¹ · Sung-Hyun Kim^{1,2},
Dong-Su Ho¹ · Bo-young Choe¹ · Tae-Suk Suh¹

¹Dept. of Biomedical Engineering, College of Medicine, Catholic University of Korea,
505 Banpo-Dong, Seocho-Gu, Seoul, Korea, 137-701

²Department of Digital Radiography, Luvantix Co., Ltd., 403-2 Moknae,
Ansan, Gyeonggi, Korea, 425-100

Flat panel based digital radiography (DR) systems have recently become useful and important in the field of diagnostic radiology. For DRs with amorphous silicon photosensors, CsI(Tl) is normally used as the scintillator, which produces visible light corresponding to the absorbed energy. The visible light photons are converted into an electric signal in the amorphous silicon photodiode. In order to produce good quality images, we need to understand the detailed behavior of DR detectors in radiation. We, therefore, investigated the relationship between DR outputs and X-ray in terms of absorbed energy, using the SPEC-78, X-ray energy spectrum model. We calculated the total filtration of X-ray equipment measuring air exposure and this value was used in the calculation of absorbed energy. The relationship between DR output and the absorbed energy of the X-ray was obtained by matching the absorbed energy with pixel values of real images under various conditions. It was found that the relationship between these two values was almost linear. The results were verified using phantoms made of water and aluminium. The pixel value of the phantom image was estimated and compared with previous results under various conditions. The estimated pixel value coincided with the results, although the effect of scattered photons introduced some errors.

Key words: digital radiography, absorbed energy, pixel value, CsI(Tl), SPEC-78