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Evaluation of a CCD X-ray Imaging Detector with the Medipix2 Detector

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Over the last decades the traditional photographic films used in radiology have been replaced by the digital X-ray imaging sensors. The main advantages of these systems are their detection efficiency of the image acquisition and the ability to directly digitally transfer and enhance obtained images. In this paper we characterize and evaluate the X-ray imaging performance of a YAG single crystal scintillator based optical camera. The camera uses a CCD sensor of size 36x36mm2 with 16 million pixels of 9x9 μm2 pitch. For the evaluation of the imaging capabilities of this camera the semiconductor pixel detector Medipix2 was used. The imaging capability is evaluated in terms of several basic characteristics: spatial resolution, edge response function, signal to noise ratio and contrast to noise ratio. Moreover the detection efficiency in the energy range 1-60keV was studied in order to determine the most suitable energetic range. A microfocus X-ray tube was used for high spatial resolution measurements in order to minimize the influence of the X-ray tube spot size. A set of testing measurements was done on edge phantom, step phantom wedge and low contrast fibres. The corresponding measurements for all systems were held under identical conditions in order to assure comparability. The results measured by the CCD camera demonstrate the possibility of a sensitive X-ray radiography imaging with high spatial resolution.

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