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Characteristics of statistical noise of the sCMOS based Neutron Computed Radiography Images- A simplified measurement approach

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Abstract content
   (Max 300 words)
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The statistical noise affects the contrast lower boundary sensitivity by contribution of average base noise such that the dynamic range cannot be improved beyond this noise component [1]. It also negatively affect contrast between materials of an object and spatial resolution by adding false fine defects which can be removed by averaging electronic filters and thereby also removing the fine features of the object under investigation. Statistical noise is a noise component that cannot be corrected for without negatively impact in images due to that possess a stochastic nature. Even if the absolute value of the fluctuations is finite according to Poisson distribution but the accurate prediction of the absolute value at a specific time is not possible [2]. Measurements to prove the behaviour of statistical noise, especially distribution of the statistical sample, is important. It is for reason that the current study is under taken to establish a simplified approach towards extracting the statistical noise component from images of a computed neutron radiography system. CCD and CMOS camera based detection systems are common in this field and the CMOS camera will be the focus of this study.
It is a complex task to extract the gray value (intensity) contribution of the statistical noise in neutron computed radiography images because of the noise contribution of all signal conversions in the signal chain – initial neutron fluence, generated photons in the scintillation screen per original neutron (including detection probability and multiplication if more than one secondary photon generated per neutron), generated photo electrons in the CCD or CMOS (Including detection probability), noise of the readout amplifier on the CCD or CMOS, noise in the first amplification stage of the analog signal, quantification noise in the ADC. This work presents preliminary results of a simplified method towards extracting the statistical noise characteristics from computed radiography images.

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