

Noise Sources and Consequences in Industrial Radiology

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Three totally different image detector principles are established today in industrial radiology: 1. Radiographic film systems using metal screens in direct contact to the double sided film emulsions, 2. Luminescence storage phosphor imaging plates (Computed Radiography) with and without metal screens, 3. Digital detector arrays (DDA) with various detection principles (energy integrating or photon counting, direct converting or scintillator based). Their industrial applications are meanwhile standardized by various committees (ASTM, CEN, ISO, etc.). Caused by the quantum nature of the X-ray radiation all discussed detectors exhibit noise in their images. The typical noise sources are photon noise, fixed pattern noise caused by detector design and noise generated from the object structure and surface. The different detection principles and the manufacturing limitations during production transfer the noise contributions differently. As the result different application limits based on the achievable image quality can be established for the different detectors. This knowledge is essential for the optimum detector selection and exposure conditions. These different noise sources and their influence on the image quality will be discussed in the presentation. Starting from the basic detection principles practical out-comings will be presented, which show that each detection principle has still his own advantages and disadvantages when considering image quality aspects.