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“Low Electronic Noise” Detector Technology in Computed Tomography

Image noise in computed tomography, is mainly caused by the statistical noise, system noise reconstruction algorithm filters. Since last few years, low dose x-ray imaging became more and more desired and looked as a technical differentiating technology among CT manufacturers. In order to achieve this goal, several technologies and techniques are being investigated, including both hardware (integrated electronics and photon counting) and software (artificial intelligence and machine learning) based solutions. From hardware point of view, electronic noise could indeed be a potential driver for low and ultra-low dose imaging, especially if one could tailor and optimize it for specific applications. We have demonstrated that the reduction or elimination of this term could lead to a reduction of dose without affecting image quality. Also, in this study, we will show that we can achieve this goal using conventional electronics (low cost and affordable technology), designed carefully and optimized for maximum detective quantum efficiency. We have conducted the tests using large imaging objects such as 30 cm water and 43 cm polyethylene phantoms (fig.1). We compared the image quality with conventional imaging protocols with radiation as low as 10 mAs (\ll 1 mGy). Clinical validation of such results has been performed as well and some findings based of noise power spectra will be discussed concerning of the source of the noise [1,2].

Author: Dr IKHLEF, aziz (FMI Medical Systems)

Presenter: Dr IKHLEF, aziz (FMI Medical Systems)

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