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# Comparison of X-ray image quality of TFT and CMOS flat-panel detector for mobile C-arm system

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Higher spatial resolution in real-time X-ray imaging such as fluoroscopy in mobile C-arm and angiography in C-arm CT imaging system is increasingly demanded by many clinicians at the hospital. They use either x-ray image intensifiers (XII) or flat panel detectors (FPD) as X-ray imaging detectors, which have inherent limitation such like image distortion, low resolution and image lag on the imaging capability. Recently, the large-area flat panel imagers with TFT (thin film transistor) and CMOS (complementary metal-oxide semiconductor) process have been widely used in various X-ray medical imaging applications including dental CT, fluoroscopy and angiography. Specially, the CMOS based X-ray detector has many advantages such as the higher readout speed, low noise, high spatial resolution and high system integration compared to amorphous silicon TFT-based flat panel detector.

In this work, we have investigated the experimental demonstration of radiation dose and X-ray image quality in mobile C-arm system with a TFT and CMOS based flat-panel detector. A-Si TFT based FPD detector having a 397 x 298 mm active area with 388 μm pixel pitch and 1024 x 768 pixels in 2x2 binning mode was used. For comparison, the CMOS x-ray detector with an active pixel sensor (APS) architecture was used. Each pixel has the special feature of two different full well capacities such as high full well (HFW) and low full well (LFW) mode. The CMOS APS detector consist of pixel size with 99μm, different frame rates (30 fps in normal mode and 60 fps in binning mode) and 14-bit ADC for low-dose, high resolution X-ray imaging.

The X-ray imaging performance such as X-ray linearity, signal to noise ratio, dynamic range, spatial resolution and DQE(Detective Quantum Efficiency) were measured and investigated. And quantitative image evaluation with fluoroscopy QA phantom was study in fluoroscopy conditions. X-ray image with about 4.0 lp/mm and spatial frequencies Higher DQE (70% at 0 lp/mm, RQA 5 condition) at low dose (below 2μGy) could be acquired. This paper will demonstrated the significant potential of X-ray CMOS flat-panel detector with high-resolution and high-frame rate in mobile C-arm system for imaging-guided interventions.

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