The advantages of using amorphous silicon x-ray cameras for radiographic patient positioning

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Digital radiographic imaging allows one to automate the setup and monitoring of patient position during external-beam radiotherapy, and can provide submillimeter precision in radiation field alignment. A new digital imaging technology using flat-panel amorphous silicon arrays offers near-film-quality spatial resolution, exceptional dynamic range in contrast, and minimal image distortion. This paper reports tests of a dpiX Flashscan 20 flat-panel camera in a fully automatic radiographic positioning application for radiosurgery.

The test camera had a field of view (FOV) of 20 x 25 cm and pixel pitch of 0.125 mm. Images of an anthropomorphic head/neck phantom were taken in the environment of the Cyberknife image-guided radiosurgery system (Accuray, Inc), using a 30 kW pulsed x-ray source operating between 60 - 120 kV at a distance of 360 cm from the camera, and compared to those obtained by the Cyberknife's present fluoroscopic CCD camera.

The dynamic range in contrast for the amorphous silicon camera is approximately one hundred times that of the Cyberknife CCD fluoroscope. The high sensitivity of the flat-panel camera yields noiseless images of the neck at x-ray exposures limited to 25 mrad per image. The flat-panel camera's spatial resolution allows millimeter-size fiducial beads to be located precisely anywhere in the body.