Purpose:
Two new wireless digital receptors were evaluated and compared with a conventional flat-panel using the International Electrotechnical Commission formalism (IEC 62220-1) for measuring modulation transfer function (MTF), noise power spectrum (NPS), and detective quantum efficiency (DQE) using two filtration schemes.

Methods:
Raw images were acquired for three image receptors (Pixium 4600, Trixell; DRX-1C and DRX-1, Carestream Health, Inc.) using a radiographic system with a well-characterized output (Philips Super80 CP, Philips Healthcare). Free in-air exposures were measured using a calibrated radiation meter (Unfors Mult-O-Meter Type 407, Unfors Instruments AB). Additional aluminum filtration (and a new alternative combined copper-aluminum filtration) were used to conform the x-ray output to IEC-specified beam quality definitions RQA5 and RQA9. Testing was performed to exclude lag effects. Assessment of the DR systems followed the IEC 62220-1 formalism. Each detector was irradiated with RQA5 and RQA9 open beams with each filtration at increasing photon fluence to determine the system conversion function. The normal exposure level (XN) was set at 1.0 mR to the detector surface. The NPS was evaluated at XN/2, XN, and at 2XN. The prescribed edge test device was used to evaluate the MTF. The DQE was then calculated from the MTF and NPS functions.

Results:
All three DR systems demonstrated similar MTFs at most frequency ranges, while the DRX-1 showed lower values near the cutoff of approximately 3.5 cycles/mm. At each exposure, the Pixium 4600 and DRX-1C demonstrated similar NPS curves that indicated better noise performance than the DRX-1. Zero-frequency DQEs for Pixium 4600, DRX-1C, and DRX-1 were approximately 63%, 74%, and 38% for RQA5 and 42%, 50%, and 28% for RQA9, respectively.

Conclusion:
In terms of DQE performance, the DRX-1C image receptor is superior to the Pixium 4600 and DRX-1. Wireless DR receptors offer high-quality alternatives to CR for portable imaging applications.

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