

Digital Radiography: Review of current commercial offerings

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Conflict of Interest Disclosure

- Consultant to Agfa Healthcare
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Digital radiography: Historical timeline

- 1980's: powder phosphor cassette-based CR (storage phosphor) systems



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- 1980's: powder phosphor cassette-based CR (storage phosphor) systems
- 1990's: integrated, high-throughput cassette-less CR systems
- 2000's: electronic DR detectors
- 2010's: wireless, cassette-based electronic detectors



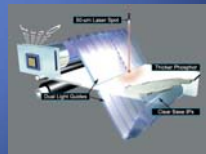
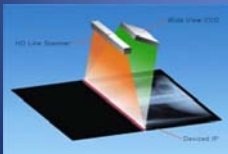
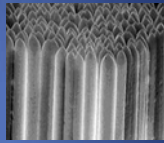
What's currently available?

Traditional cassette-based CR systems



Advanced cassette-based CR systems

- Structured phosphor (CsBr)
- Line scanning
- Dual-side reading

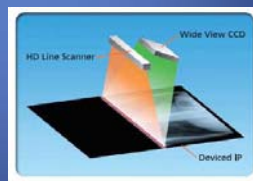


Fuji “DR” Velocity SpeedSuite

- They call it “DR” but
- It’s really stimulated emission (storage phosphor) technology
- CR image capture, integrated and synchronized with x-ray generation system



Fuji “DR” Velocity U (upright)



Fujifilm “DR” Velocity U fp

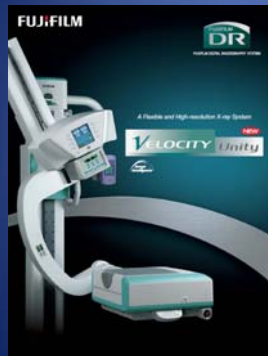
The new FUJIFILM DR provides premium image quality through optimized resolution and DQE.

In radiographic examinations, reducing the exposure dose is an important challenge. The FUJIFILM DR VELOCITY Up is a high-resolution upright digital radiography system, which uses a columnar crystal X-ray detector achieving twice the DQE (Detective Quantum Efficiency) of the current FUJIFILM devices thus providing significantly improved image quality.

Focused Phosphor Technology

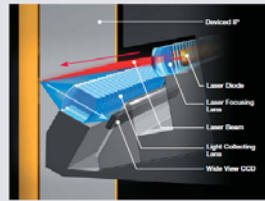
Conventional Phosphor Plate vs. Focused Phosphor Plate

Fujifilm "DR" Velocity Unity

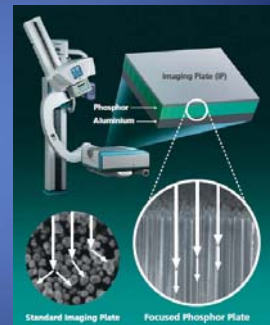
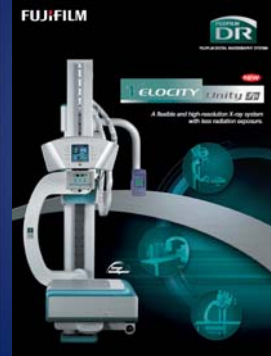


HD LineScan Technology

For image acquisition, the Fujifilm DR VELOCITY Unity uses a revolutionary HD LineScan technology which employs a wide-view CCD and a built-in Device IP. The detector unit is significantly thinner than previous models yet has an increased throughput, reading images at a high resolution of 100µm.



Fujifilm "DR" Velocity Unity fp



fp = focused phosphor (not flat panel)

Fuji "DR" Velocity T (table)



Removable IP / scanner assembly



HD LINESCAN:

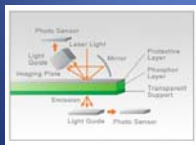


Fujifilm "DR" Velocity T fp

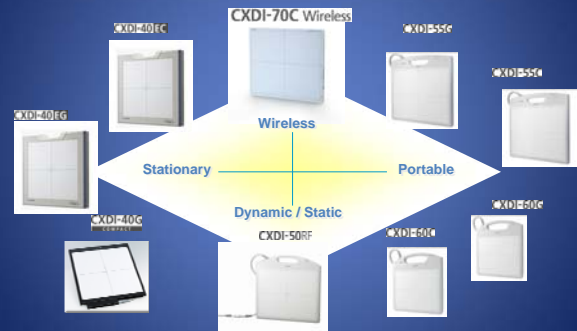


Fuji FCR XU-D1

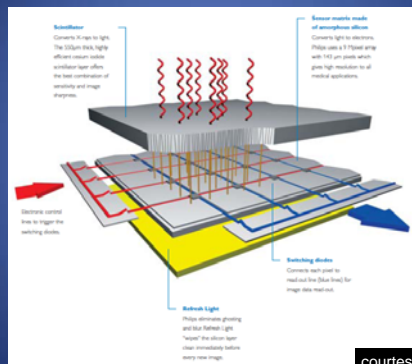
- 43 x 43 dual-side IP
 - Thicker phosphor layer
 - Higher DQE
- Energy subtraction



Canon DR Detectors



Indirect flat panel DR detector



courtesy of Philips

Fully integrated DR Room



(Philips)

Fully integrated DR Room



Fully integrated DR Room



Fully integrated DR Room



Fully integrated DR Room



Swissray

- Indirect capture DR technology
- CCD or Indirect FPD



ddR Element



ddR Formula

GE Digital Radiography



Siemens Digital Radiography

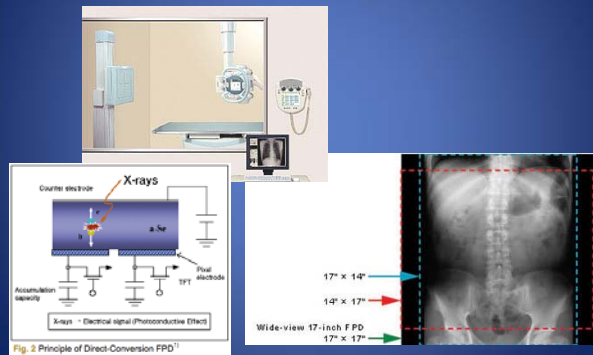


Fuji AcSelerate

Fully integrated & highly automated DR room, a-Se FPD



Shimadzu Direct Conversion FPD system



Portable applications



"Tethered" cassette-based FPD



Wireless DR cassette



(Carestream)

Wireless DR cassette



(Canon)

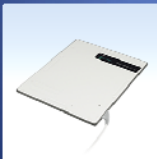
Wireless DR cassette



(Konica-Minolta)

Wireless DR cassette

- Wired or wireless DR
- Irradiation side sampling (ISS)

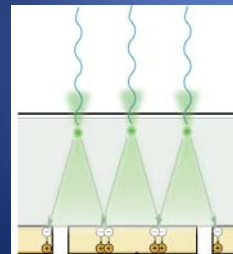


(Fuji)

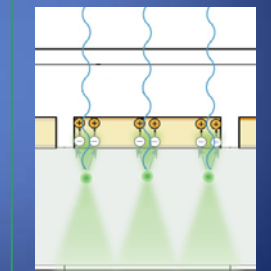
Fuji Irradiation Side Sampling (ISS)

FDR D-EVO™ portable FPD

Traditional GOS FPD



Fujifilm's ISS GOS FPD

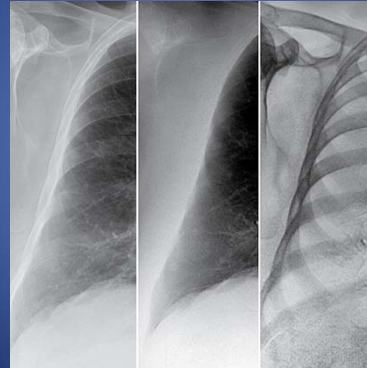


(Fuji)

Advanced applications

- Conventional linear tomography
 - CR & some DR (long exposure time)
- Dual energy subtraction
 - CR (single exposure with dual screens)
 - DR (kVp switching, rapid readout - 200 ms)
- Tomosynthesis
 - DR (rapid readout)

Single-exposure dual energy



(GE)

Digital tomosynthesis



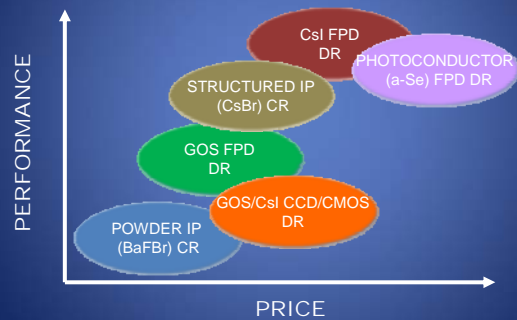
(GE)

Digital tomosynthesis



(GE)

CR/DR Price vs. Performance



Conclusion

- Stimulated emission storage phosphor cassettes
 - still have a role in digital radiography
- Cassetteless CR and DR
 - enable high patient throughput, faster workflow
- Advanced SP and FPD design
 - increased DQE, better imaging performance
- Fast readout DR detectors
 - advanced applications, eg. tomosynthesis and DE
- Wireless cassette-based DR detectors
 - These advantages, plus bedside use and backward compatibility

Acknowledgements

- | | |
|--------------|------------------|
| • Agfa | • Konica-Minolta |
| • Canon | • Philips |
| • Carestream | • Shimadzu |
| • Fuji | • Siemens |
| • GE | • Swissray |