

Electronic Portal Imaging Devices

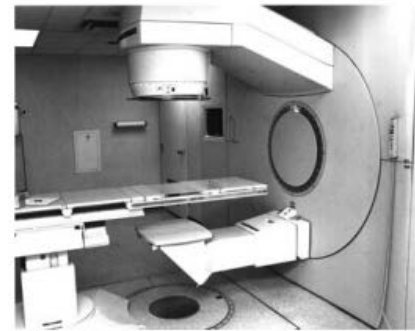
EPID Technologies

- Optical
 - Camera + scintillator
 - Scintillation crystal + photodiode
 - Active Matrix Flat Panel Imager (AMFPI)
- Non-Optical
 - Gas electron multiplier
 - High voltage rectifier diode array
 - Photovoltaic detector array
 - Matrix liquid IC
 - Kinesthetic charge detector

What type of EPID are these?

Describe their method of image generation.

What were some advantages / disadvantages of these devices?



(a)



(b)



(c)



(d)

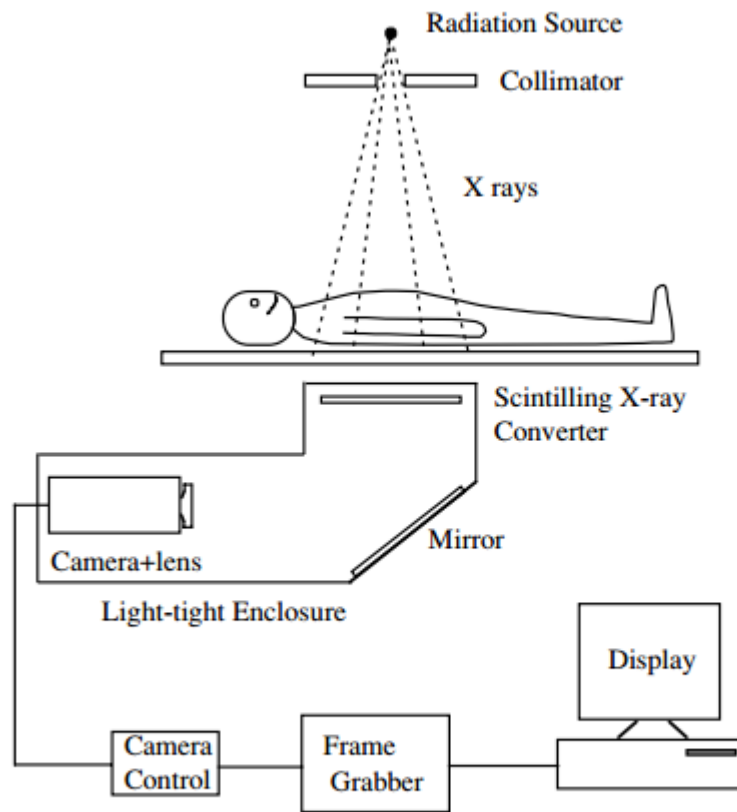
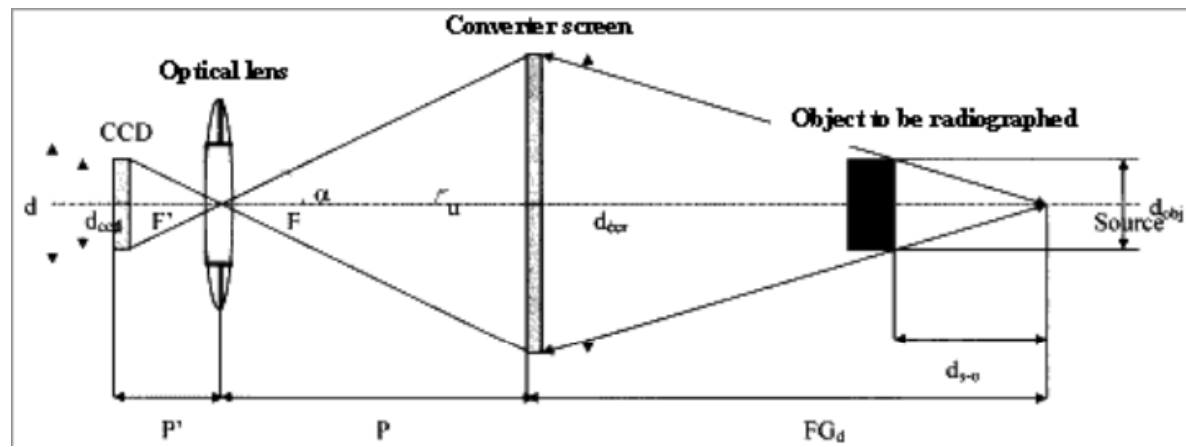
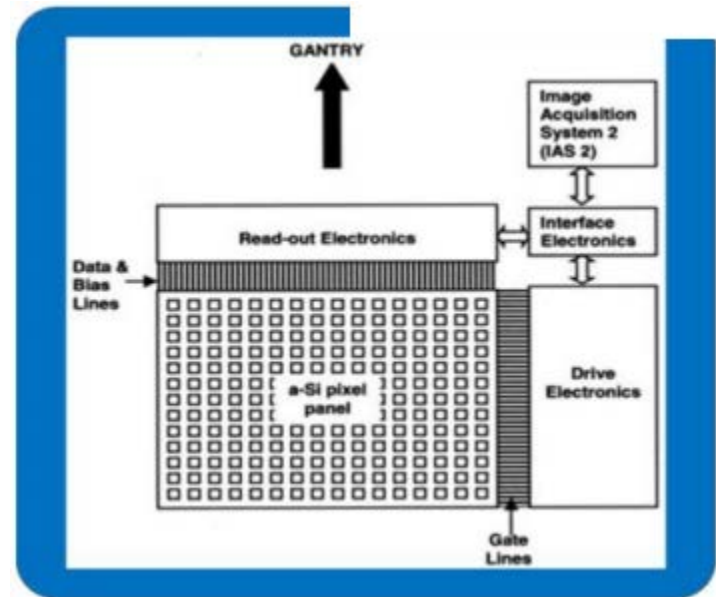
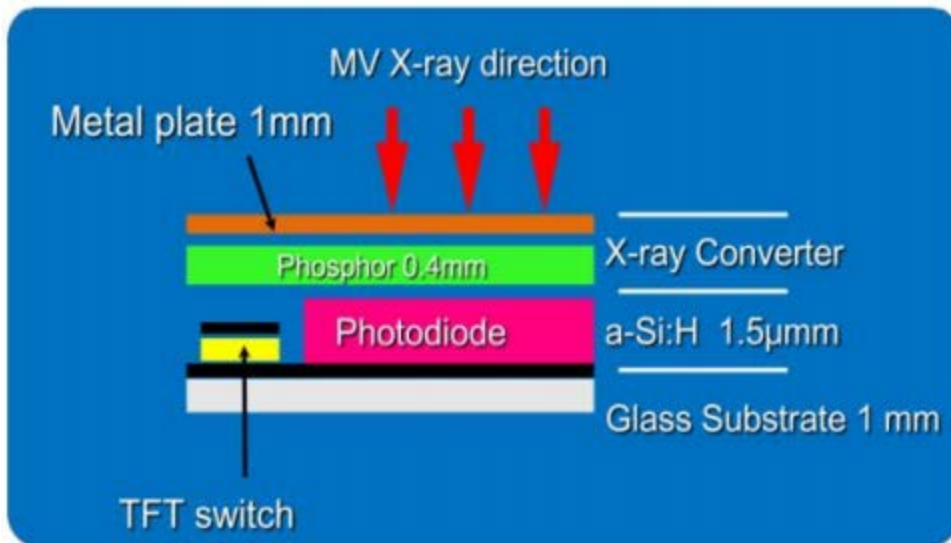


Figure 4. Schematic illustration of a camera-based EPID with the x-ray detector (a phosphor screen) optically coupled to the camera using a mirror and lens.



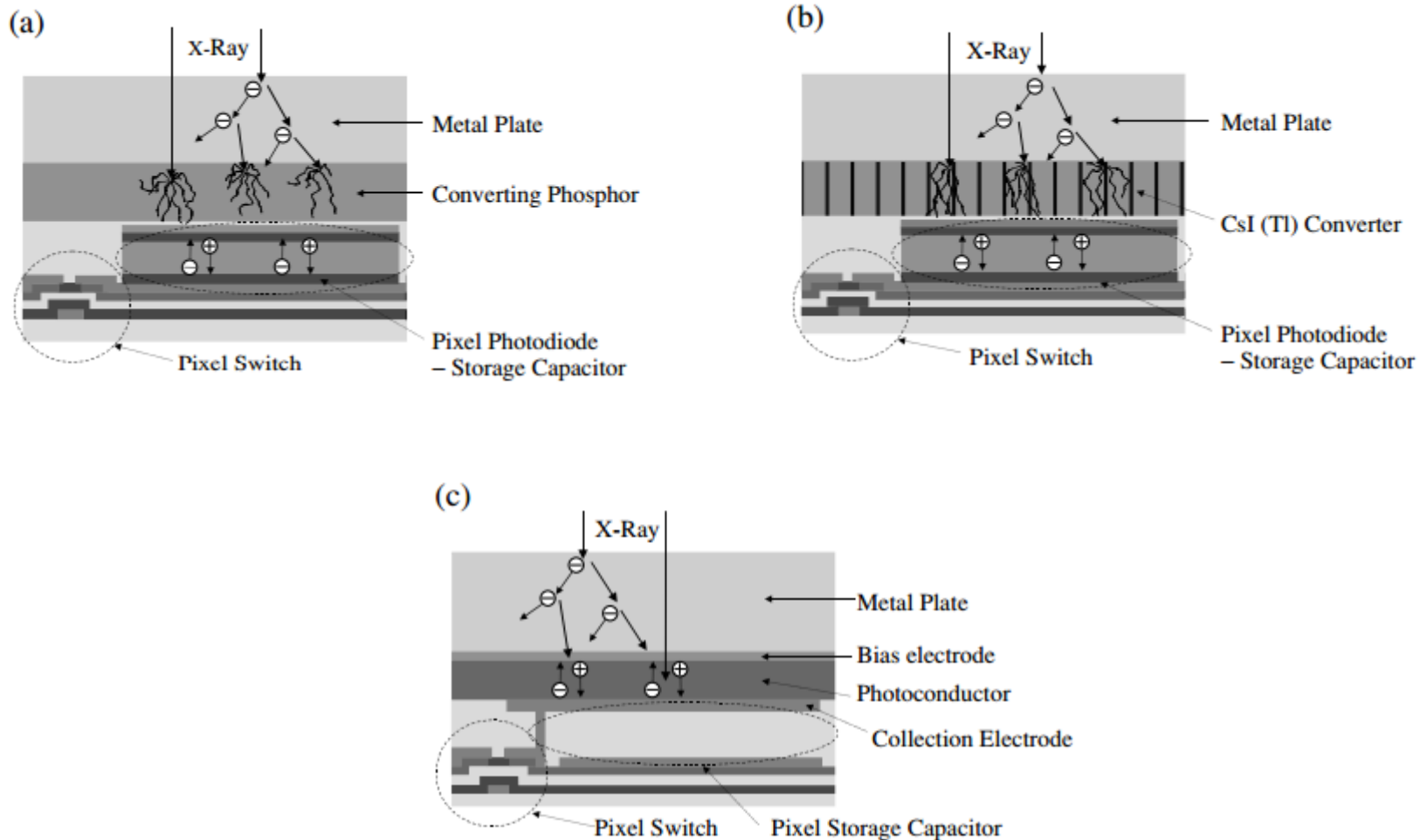
Magnification
and Resolution?

- What type of EPID is illustrated below?
- Advantages / Disadvantages?

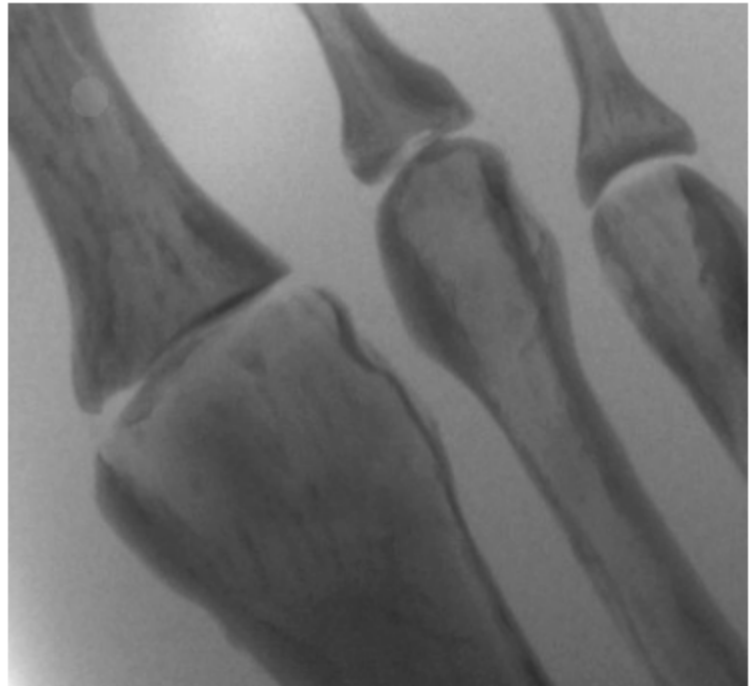
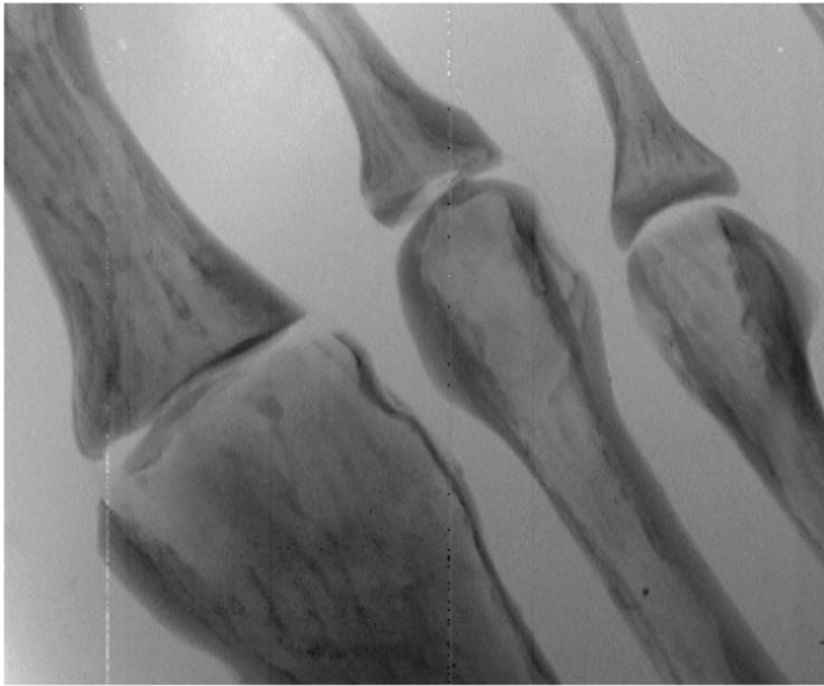


What is the main difference between a/b and c?

(all images show the x-ray converter over a single pixel)



Which image was acquired with indirect detection?



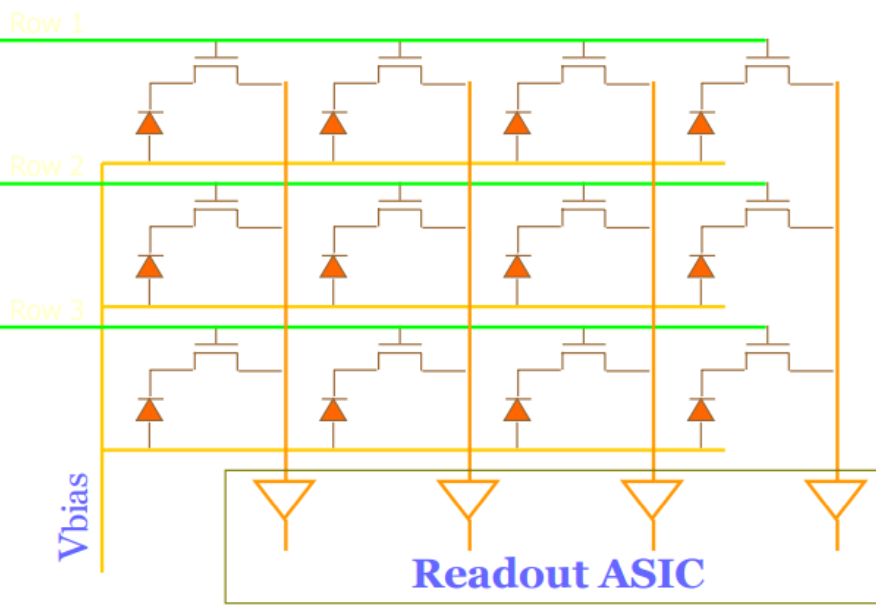
Varian PortalVision Advanced Imaging Specs

PortalVision Advanced Imaging Specifications

	AS500-II	AS1000
Active imaging area	30.1 x 40.1 cm ²	30.1 x 40.1 cm ²
Field of view at isocenter	25.1 x 33.5 cm ² (120 cm SID) to 16.7x22.3 cm ² (180 cm SID) [Imaging] 30.9 x 41.2 cm ² (97.5 cm SID) to 16.7 x 22.3 cm ² (180 cm SID) [Portal Dosimetry]	25.1 x 33.5 cm ² (120 cm SID) to 16.7 x 22.3 cm ² (180 cm SID) [Imaging] 30.9 x 41.2 cm ² (97.5 cm SID) to 16.7 x 22.3 cm ² (180 cm SID) [Portal Dosimetry]
Pixel matrix	512 x 384	Selectable: 1024 x 768 or 512 x 384
Pixel pitch	0.784 mm	0.392 mm or 0.784 mm
Energy range	4 - 25MV	4 - 25MV
Supported dose rates (imaging)	50 - 1000 MU/min	50 - 1000 MU/min
Supported dose rates (Portal Dosimetry)	50 MU/min – 500 MU/min (100 cm SID) 50 MU/min – 600 MU/min (125 cm SID)	50 MU/min – 900 MU/min (100 cm SID) 50 MU/min – 1000 MU/min (125 cm SID)
Digitization	14-bit image	14-bit image
Image acquisition rate	Up to 12 frames/second depending on Clinac dose rate and pixel matrix	Up to 23 frames/second depending on Clinac dose rate and pixel matrix
Acquisition techniques	High Quality (optimized image quality, detector readout while MV beam is paused) Low Dose (optimized dose, detector readout while MV beam is paused) Integrated (for Portal Dosimetry; detector readout during MV beam on)	High Quality (optimized image quality, detector readout while MV beam is paused) Low Dose (optimized dose, detector readout while MV beam is paused) Integrated (for Portal Dosimetry; detector readout during MV beam on)
Acquisition time	~1-3 seconds from beam on to image display	~1-3 seconds from beam on to image display
Typical exposure	1-3 MU	1-3 MU
Minimum exposure	1 MU (low dose mode)	1 MU (low dose mode)
Maximum exposure	999-1999 (IMRT/integration mode) depending upon accelerator dose limits	999-1999 (IMRT/integration mode) depending upon accelerator dose limits
Housing	Standard PortalVision image detector housing, retrofitable on existing Exact arms and R-arms	Standard PortalVision image detector housing, retrofitable on existing Exact arms and R-arms
Weight	10 kg	10 kg
Radiation hardness	Using the system under standard clinical conditions ¹ , the detector (panel & surrounding electronics) lifetime is expected to be ≥ 4 years.	Using the system under standard clinical conditions ¹ , the detector (panel & surrounding electronics) lifetime is expected to be ≥ 4 years.
Compatibility with	Clinac® linear accelerator, Clinac iX, 4D Treatment Console	Clinac, Clinac iX, Trilogy® system, 4D Treatment Console

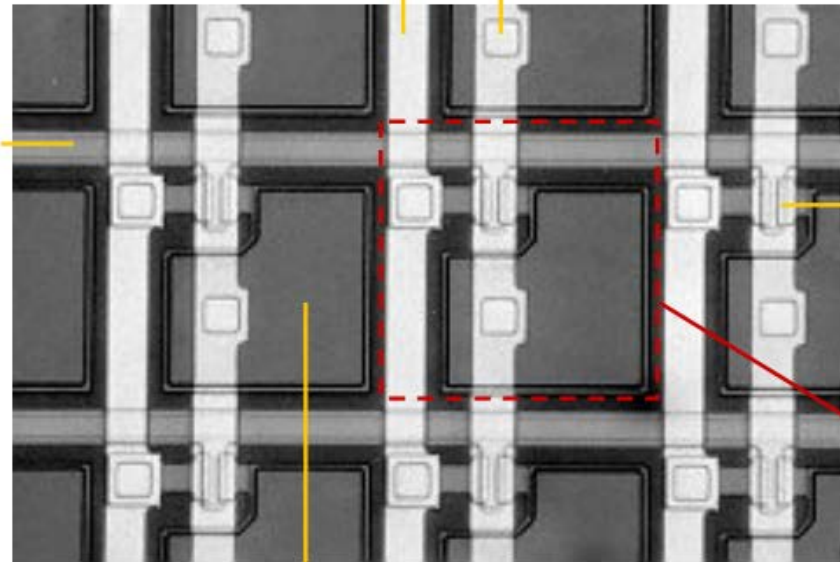
Schematic

Gate Driver



- Actual pixels
Data Line Bias Line

Row Line



TFT Switch

One Pixel

Photodiode