

## Practical CR (cassette-based digital radiography)

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## Technique Selection

film-screen

CR

100 speed (2 mR)

200 speed (1 mR)

400 speed (.5 mR)

200 speed class (1 mR)

increase mAs for extremities to improve edge enhancement

increase kVp for vital areas to reduce exposure and penetrate the part

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## Exposure Indicators

• Fuji (S number)

- 1 mR to image plate is ideal:  $\frac{200}{.5 \text{ mR}} = 400$ ;  $\frac{200}{1 \text{ mR}} = 200$ ;  $\frac{200}{2 \text{ mR}} = 100$

• AGFA (LgM)

- 1 mR to image plate is ideal:    1.9                    2.2                    2.5                     $\begin{matrix} 10^0 = 1 \\ 10^1 = 10 \\ 10^2 = 100 \\ 10^3 = 1000 \end{matrix}$

• Kodak (EI)

- 1 mR to image plate is ideal:    1700                    2000                    2300  
2000 + (1000 x log (E))

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## Exposure Indicators

- Optimal value ranges
  - Fuji S number = 180 - 220
  - Agfa Log mean number = 2.1 - 2.3
  - Kodak EI number = 1950 - 2050
  - the closer you can get to these target numbers the more optimal the image will be

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.5 mR      1 mR      2 mR

.5 mR has quantum noise because of insufficient quantity of x rays.  
2 mR has lower contrast because of increased scatter radiation.

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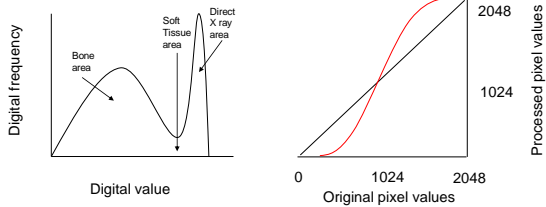
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## Histograms/Lookup Tables



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## Cassette selection

- Select the smallest cassette size possible for the part.
  - reader scans the entire IP and smaller IPs are scanned at a faster frequency
- Has the cassette been used within the last 48 hours? If not, erase the imaging plate (IP).
  - background = 60-80  $\mu\text{R}/\text{day}$  (IPs sensitive to 80  $\mu\text{R}$ )
- Blocker position
  - green bar to top or to the right side of patient
  - blocker down

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## Grid selection

- Since IP is sensitive to scatter, use grid for parts greater than 10 cm (and for all adult portable chests)
- Low frequency grids (80 – 100 lines per inch) may cause moire effect if grid lines run the same direction as the laser scans the IP (103 scans/inch)



- use 152 lines per inch (>60 lines/cm)
- higher frequency means less lead content, so need a higher ratio grid to compensate
- no higher than an 8:1 ratio for portables

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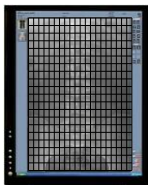
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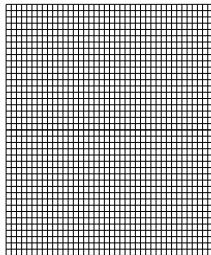
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## Spatial Resolution

- Spatial resolution is the ability of an imaging system to display two adjacent structures as being separate. The ability to sharply and clearly define the extent or shape of features within an image.



1000 x 1200 = 1MP  
1500 x 2000 = 3MP  
2000 x 2500 = 5MP



2000 x 2000 = 4MP

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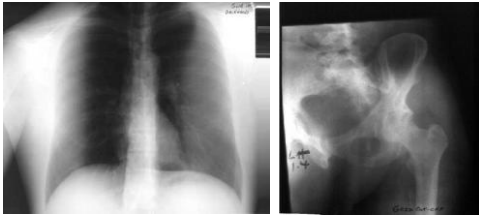
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## Grid Cut-off



Film/Screen Grid Cut-off

Low density  
Loss of contrast  
Grid lines

Digital Image Grid Cut-off

Quantum noise  
Loss of contrast  
Low E.I. number  
Grid lines

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## Positioning and Collimation

- With CR you have more exposure latitude but less positioning latitude
- Part in center of cassette (1 view/cassette)
- Part vertical or horizontal, not diagonal
- Preferably four sides of collimation
- Close collimation to reduce scatter, but you can collimate too small (lateral nasal bones, pediatric fingers)
  - Exposed field must cover at least 25% of IR

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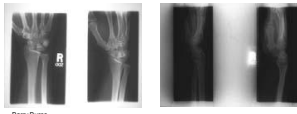
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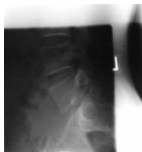
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## Positioning and Collimation errors



Barry Burns



Exposure average included the scatter



Exposure average included the lead shield

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